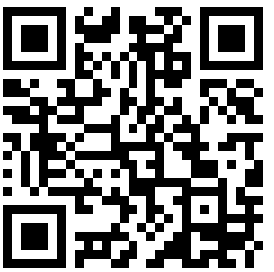
OIL WELL SUPPLY CO.

LIMITED

BRADFORD & OIL CITY, PA.

1884

ILLUSTRATED CATALOGUE.



ILLUSTRATED CATALOGUE

OF

OIL AND ARTESIAN

WELL SUPPLIES

MANUFACTURED BY THE

OIL WELL SUPPLY CO., LIMITED,

BRADFORD AND OIL CITY,

PENNA., U. S. A.

NEW YORK CORRESPONDENTS:

THE EATON, COLE & BURNHAM CO.,

82 & 84 FULTON STREET, NEW YORK.

1884.

PRICE LISTS FURNISHED ON APPLICATION.

E. P. COBY & CO.,
PRINTERS AND STATIONERS,
93 & 95 WILLIAM ST.,
NEW YORK.

Offices of

The Oil Well Supply Co., Limited,

Bradford and Oil City, Pa.

October 1, 1884.

We present herewith the only fully Illustrated Catalogue yet issued, of the Machinery, Tools and Supplies, used in drilling and operating Artesian Wells for oil or water, or to test land for coal or other minerals.

We show every article employed, and describe all that require explanation.

In the Oil Regions of Pennsylvania, New York and Ohio, over 30,000 oil wells have been drilled since 1859. In no other part of the world has this industry been so greatly developed. Twenty-four years of experience have improved and perfected every article used, and several hundred patents have been taken out for valuable inventions relative to the business.

We have the largest and best equipped, and most numerous manufactories, and our facilities for making well supplies are not equalled by any other establishment.

We are the only firm that can make everything needed. All other dealers purchase more or less from us, while we do not need to purchase from any other. We either own, control or have licenses under all the leading and most valuable patents.

We sell everything required to drill, equip, complete and operate an oil, salt, water or test well, and can send experienced and reliable workmen, with the apparatus, to any part of the world.

Besides furnishing a large part of the supplies used in the Oil Regions, we have furnished, or are now furnishing, men, machinery and outfits for many of the States and Territories, and for Russia, Austria, Hungary, Roumania, Cuba, Australia, Central America, Mexico, Italy, Germany, and other countries.

Everything that we make or sell is of the best material, most perfect finish, thoroughly tested and carefully inspected.

The stockholders of the Eaton, Cole & Burnham Company, 82 & 84 Fulton Street, New York, are our principal stockholders. The two Companies have the same President, and are intimately connected in all business matters.

Our customers have, therefore, subject to their orders:

The Stock of the Eaton, Cole & Burnham Company, at New York City.

The Brass and Iron Foundries and Manufactory of that Company at Bridgeport, Conn.

Our own Blacksmith, Tool and Machine Shop on North Mechanic Street, Bradford, Pa., where drilling and "fishing" tools are made.

Our Sand Reel Shop on Davis Street, Bradford, Pa., where Bull and Band Wheels, Sand Reels and Wooden Rigs are constructed.

Our Machine Shop at Oil City, Pa., where wrought iron and steel work of all kinds is done.

And our Lumber and Sucker Rod Mill at Van Wert, Ohio.

Our principal stores and stocks are at Bradford and Oil City, Pa., and we have branch stores at Allentown, Richburg and Bolivar in the State of New York, and at Garfield, Clarendon, Warren, Derrick City, Aiken, Big Shanty, and Eldred, in Pennsylvania.

Orders will be filled at the lowest market prices. Correspondence solicited from any part of the world, and all information desired will be cheerfully and promptly furnished.

JOHN EATON, President, Bradford, Pa.

E. T. HOWES, Treasurer, Bradford, Pa.

KENTON CHICKERING, Secretary, Oil City, Pa.

Or care of

The Eaton, Cole & Burnham Co.,

82 & 84 Fulton Street, New York.

PREFACE.

To fully detail every step taken and everything done in drilling and operating an oil well, and to fully describe the functions of each implement which is at times used in or around an oil well, would extend unreasonably the proper limits of this catalogue.

Our descriptions are necessarily brief, but we have endeavored not to be wanting either in clearness or accuracy.

An oil well is a hole of small diameter drilled to the oil-bearing rock, which rock, in Pennsylvania, lies from 600 to 2,000 feet below the surface.

The same processes used here to sink oil wells can be used in other parts of the world for oil or water wells, or for such holes as are often drilled where the existence of mineral is supposed, as the drillings taken out by the sand pump will, of course, show the character of the stratum in which the drill is working.

As there are many places where water in abundance can be obtained by artesian wells, and many where there are evidences of the existence of oil, or of deep-lying valuable minerals, we have so prepared this catalogue that any one in any part of the world may learn what material, implements and tools are required to drill, finish and operate artesian wells, and may also understand the nature of the work.

We first present a side elevation of a complete rig (figure 1), with the tools suspended in the derrick ready to be lowered into the well, and next (in figure 2) a ground plan of a drilling rig, and we follow these figures with a statement of the wood and iron material required for the purpose of erecting and furnishing a derrick, and describe the method which is used in the oil regions of Pennsylvania for sinking oil wells.

The operations of driving pipe, and also of casing, tubing, pumping and torpedoing a well, are dwelt upon. Various kinds of rigs for wells of different depths are illustrated and described, and every peculiar article used is separately figured.

Our descriptions are not intended to teach the art to the inexperienced, for that would be impossible, but merely to give a general idea of the business and its requirements.

If there is any point upon which any one requires more explicit and detailed information, we will be happy to furnish it on request.

For the first time an attempt has been made to illustrate "fishing" tools. The operation of removing from a well any obstruction or broken tool, or other article which, either by accident, carelessness or malicious design, has been lost in the well, or fastened therein, is called "fishing," and it requires in the operator the highest skill, unwearied patience, and oftentimes great fecundity of invention. Cuts of all the standard "fishing" tools are shown, but as each "fishing" job is nearly always different in some respects from any other, it often occurs that a special tool has to be made for a particular occasion.

Our facilities for manufacturing special tools are unexcelled, and such manufacture always receives the most careful attention, and is given preference over any other work.

The market prices of oil-well supplies frequently vary, and we issue from time to time printed price lists, which are freely sent to any interested.

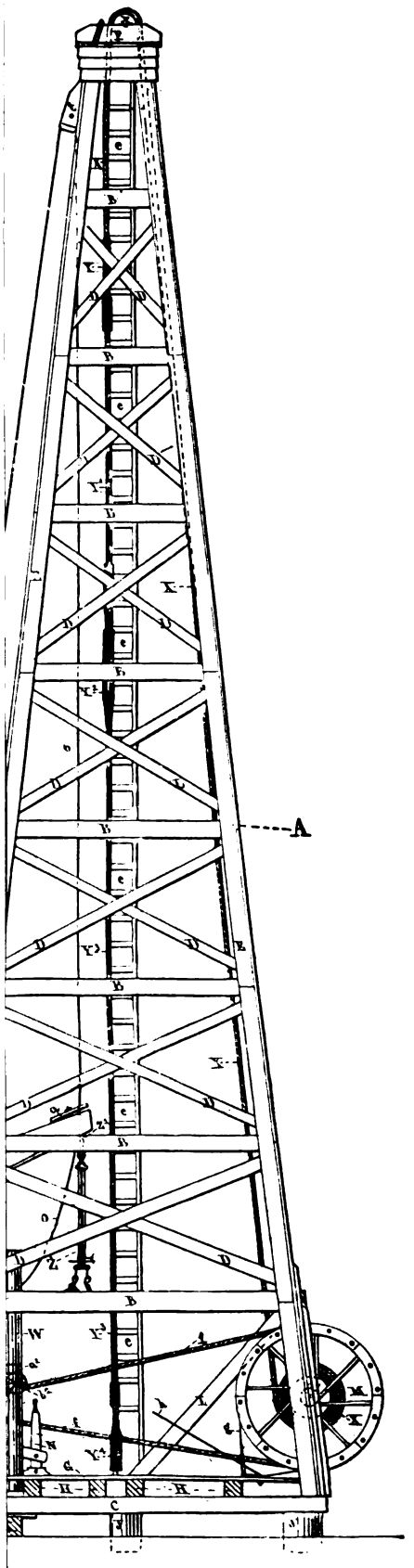
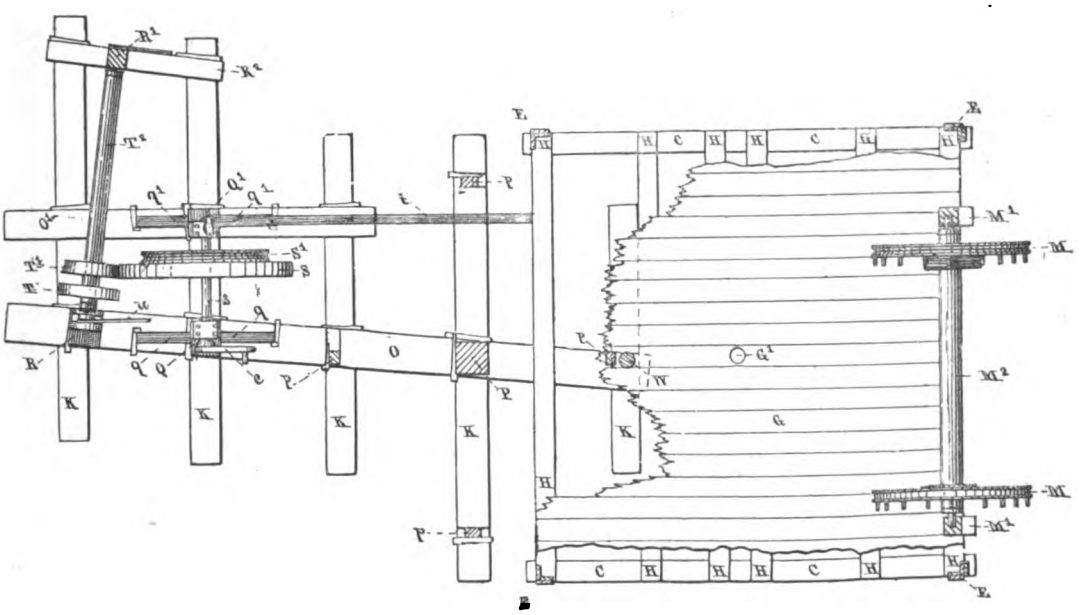


FIGURE 2.

GROUND PLAN OF DRILLING RIG (see Figure 1).



LETTERS OF REFERENCE TO FIGURE 2.

C.—Derrick Sill.
E.—Derrick Corner.
G.—Derrick Floor.
*G*¹.—Well Hole.
H.—Derrick Floor Sill.
K.—Mud Sill (see diagram I).
M.—Bull Wheel (see diagram VI).
*M*¹.—Bull Wheel Post (see diagram VI).
*M*².—Bull Wheel Shaft (see diagram VI).
O.—Main Sill (see diagram I).
*O*¹.—Sub or Counter Sill (see diagram I).
P.—Samson Post.
Q.—Front Jack Post.
*Q*¹.—Back Jack Post.
R.—Knuckle Post (see diagram II).
*R*¹.—Sand Reel Back Post or Tail Piece.
*R*².—Tail Sill (see diagram I).
S.—Band Wheel (see figures 34 to 37).
*S*¹.—Tug Pulley (see figure 37).
T.—Sand Reel Brake Pulley (see diagram II).
*T*¹.—Sand Reel Friction Pulley (figures 38 to 42).
*T*².—Sand Reel Shaft (figures 38 to 42).
W. Headache or Deadhead Post.
c.—Band Wheel Crank (see figure 45).
i.—Brace of Back Jack Post *Q*¹.
p.—Samson Post Brace.
q.—Brace of Front Jack Post *Q.*
*q*¹.—Brace of Back Jack Post *Q*¹.
s.—Band Wheel Shaft (see figure 45).
u.—Sand Reel Draw Bar.

Material Required for Complete Rig.

In constructing a rig the following timbers, lumber, nails and irons are employed. The sizes of the timber may be exceeded, but should not be diminished (unless the Raifsnyder Rig Irons, figures 60 to 65, are used). If necessity compels smaller sizes, the deficiency must be supplied by extra bracing.

HEMLOCK TIMBER.	Size, Inches.	Length, Feet.
1 Mud Sill, K^1, diagram I	10 x 12	12
1 Mud Sill, K^2, diagram I	14 x 18	20
1 Mud Sill, K^3, diagram I	14 x 16	12
2 Mud Sills, K^4 and K^5, diagram I	14 x 16	20
2 Derrick Sills, diagram I and *C C*, figures 1 and 2	10 x 10	21
6 Derrick Floor Sills, diagram I and *H H*, figures 1 and 2	8 x 10	20
2 Engine Mud Sills	14 x 16	12
2 Engine Cross Sills	10 x 10	8
1 Engine Block, *m*	18 x 20	9
1 Main Sill, diagram I and *O*, figures 1 and 2	16 x 18	30
1 Counter Sill, diagram I and O^1, figure 2	16 x 16	16
1 Tail Sill, diagram I and R^2, figure 2	10 x 10	9
1 Samson Post, *P*, at top, 18 x 18 ....at bottom,	18 x 20	14
1 Bull Wheel Post, Brace *L* (may be round)	6 x 6	14
1 Walking Beam, *U*, 12 x 26 in centre....at ends,	12 x 12	26
1 Dead Head Post, *W* (may be round)	7 x 7	13
1 Engine Sill Brace, *i* (may be round)	8 x 8	26

HARD WOOD.		
6 Foundation Posts, *J J*	18 x 18	4
2 Bull Wheel Posts, M^1 M^1	10 x 10	11
1 Piece for Tail Post R^1 and Crown Pulley Block *F*	12 x 12	10
1 Piece for two Jack Posts, *Q*, Q^1, and Knuckle Post, *R*	16 x 16	16
2 Pieces for Keys	3 x 5	16
1 Pitman, *V*, 4 x 9, tapered to	4 x 4	12
1 Plank for caps and Snatch Block	2 x 12	12

SAW MILL LUMBER (generally Hemlock).	
2 Samson Post Braces, *p p*, 6 x 8 inches, also makes two Jack Post Braces, *q q*	18
2 " " " " " " " " " " " " " "	16
26 Pieces, 2 x 8, principally for Derrick Corners, *E E*	16
6 " 2 x 10, " " " " "	18
22 " 2 x 10, " " " " "	16
5 " 2 x 12, First Tier Girths, *B*	18
6 " 2 x 8, " " " *D*	20
4 " 2 x 10, Doublers or Strengthening Plank	24
8 " 2 x 6, Second Tier Braces, *B*	18
40 " 1¼ x 6, Derrick Upper Girths	16
12 " 2 x 6, Engine and Belt House Sills	16
24 " 2 x 4, Plates, Ladder, Rafters, etc	16
800 feet, board measure, of 2 inch Plank for Derrick Floor, *G*	20
4,000 feet inch Boards	16

For Winter Rig (figure 3) add 500 feet more Boards. The whole makes about fifteen thousand feet, board measure.

In this estimate the Bull Wheels, *M*, figures 30 to 34, Band Wheel, *S*, figures 35 to 37, and Sand Pump Reel, *T*, figures 38 to 42, are not included, as it is better to buy them complete.

NAILS.

125 Pounds of 10d. Nails, which are 3 inches long.
25 " " 20d. " " " 4 " "
100 " " 30d. " " " 4½ " "

RIG IRONS.

An outfit of Rig Irons consists of Shaft, Collar, Crank, Wrist Pin and pair of Flanges with Keys and Bolts ..... see figure 45
1 Stirrup, *v*, for Pitman, *V* ..... " " 46
1 Set of Centre Irons, with Bolts, *k* ..... " " 47
2 Gudgeons and 4 Bands ..... " " 48
1 Derrick (or Crown) Pulley, *x* ..... " " 51
1 Sand Pump Line Pulley, *T* ..... " " 50
1 five-inch Brake Band, Lever and Staple ..... " " 70 to 72
1 Back Brake for Sand Pump Reel ..... " " 73
6 Bolts, ¾-inch, assorted ..... " " 907
1 Pair Boxes for Band Wheel Shaft ..... " " 52
1 Walking-Beam (or Drilling) Hook, *z*¹ ..... " " 49
1 Sand Pump Reel, complete ..... " " 38

TIME.

To erect a Carpenter's Rig, complete, usually requires from 30 to 36 days' labor. Experienced gangs, accustomed to each other, and working long hours, can sometimes do it in half the time.

Description of Figures 1 and 2, and of the modern method of Sinking Artesian Wells.

The process of obtaining water, either salt or fresh, and of testing lands for minerals by sinking holes of small diameter, has been known for many hundred years.

In Europe it was first practiced in the Province of Artois, in the north of France, whence the name Artesian is derived. There is within the gardens of a former Dominican Convent, at Lillers, in that Province, a drilled well which has flowed continuously since the year 1126, and unmistakable traces of much more ancient ones are found in various countries, particularly in China.

Formerly it was a very difficult, tedious and expensive operation to drill a deep well, but now one can be put down two thousand feet at a tenth of the cost, and in less than a tenth of the time that was once required.

The modern manner is an adaptation of steam power to the method practiced for ages in China.

Free falling tools, suspended by a cable and worked by steam power, are used, the weight of the tool being so great as to give blows of sufficient force to pierce the hardest rock. The operation is often called boring, but wells are not bored. They are drilled.

In the Oil Regions of Pennsylvania and vicinity there have been sunk more Artesian Wells than in all other parts of the world together, and great industries have been created for manufacturing the apparatus and tools to readily and safely sink wells to great depths.

THE OIL WELL SUPPLY COMPANY, Limited, makes Rigs and furnishes apparatus for wells of any depth. But when a well is to be sunk in a new locality, and it is uncertain what depth the drill must go, we would recommend only the best rig, the heaviest tools, and the strongest materials. We will describe, first, such a rig as is used for drilling over 1,000 feet. We would recommend the smaller rigs only for depths from 500 to 1,000 feet, and the portable rigs only to 600 feet, although in the hands of skillful men and under favorable circumstances, these depths can be greatly exceeded.

The standard diameter of Artesian Wells, which long experience has demonstrated to be the best for all purposes, is 5½ inches, and tools are generally made of that size, but our facilities are ample for supplying apparatus for any other diameter.

The materials to drill a deep well are, first, a Cable, usually 1⅞ inches in diameter, and a Sand Pump Line, ⅞-inch in diameter (see figure 76), of a length sufficient to reach the full depth desired. (As the Cable and Sand Line stretch in use, a 1,000 feet cable will drill 1,100 feet.)

Second: A set of Drilling Tools, sixty feet long, weighing about 2,400 pounds (see figures 115 to 122), and a Sand Pump or Bailer (see figures 225 to 230).

The object of the appliances above ground is to enable the Drilling Tools to penetrate the rock.

The location of the intended well having been determined, a space about 90 feet long by 25 feet wide should be cleared and levelled.

THE CARPENTER'S RIG.

By this name is designated:

First:—The foundation timbers, diagram I, the Engine Block, *m*, and its Mud Sills.

Second:—The Samson Post, *P*, Jack Posts, *Q* and Q^1, and Reel Supports, *R* and R^1.

Third:—The Walking Beam, *U*, Band Wheel, *S*, and Sand Pump Reel, *T*.

Fourth:—The Derrick, *A*, with Bull Wheels, *M*, and Crown Pulley, *x*.

Fifth:—An engine house for the protection of the engine from the weather. Where drilling is carried on during the winter or other inclement season, the lower part of the derrick is enclosed so as to protect the workmen. See figure 3.

FOUNDATION TIMBERS.

(All reference letters, except $K^{1,2,3,4,5}$, relate to figures 1 and 2.)

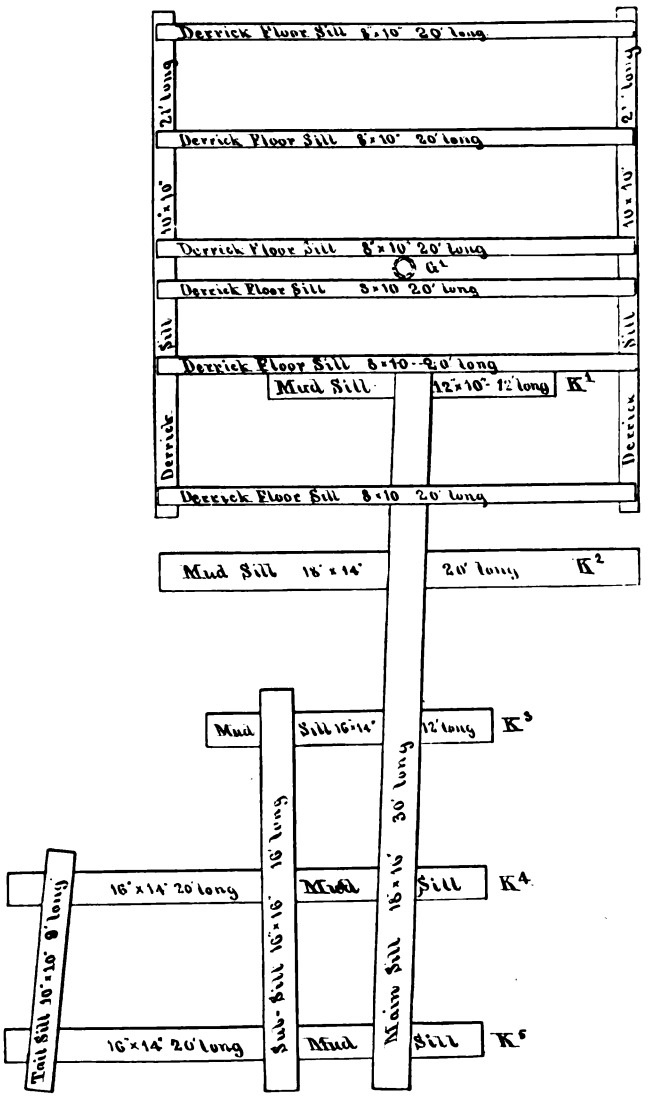


DIAGRAM I.

The accompanying diagram, I, shows all the foundation timbers, except the corner posts under the derrick and the engine supports. The mud sills, $K^{1,2,3,4,5}$, are placed in trenches. The centre line of the longest mud sill, K^2, should be 12½ feet from the well hole, G^1. At an equal distance from K^2, the mud sill, K^4, should cross the point where the front jack post, *Q*, will stand. Six feet from that will be mud sill, K^5. K^3 is midway between K^2 and K^4, and the short sill K^1 is placed within the lines of the derrick. On these mud sills rests the main sill, *O*. All the mud sills, except K^1, have gains two inches deep to receive the sills, *O*, O^1 and R^2.

The main sill, *O*, is generally laid so that the samson post, *P*, and front jack post, *Q*, will have full bearings upon it, and if it is less than twenty-four inches wide it cannot stand at right angles to the derrick. If it is two feet wide it can be laid in line with the well hole, G^1, by placing the samson post, *P*, flush with one and the jack post, *G*, flush with the other side.

The centre line runs from the middle of the round part of the wrist pin (figure 45) through the centre of the samson post, *P*, to the well hole, G^1, and on this line the walking beam, *U*, must be mounted and vibrate, and to this line all the other parts, except the common sand reel, must be squared or lined.

The sizes given in diagram I may be exceeded, but not lessened, unless Raifsnyder Rig Irons (figures 60 to 65) are used, or unless extra bracing is provided.

After all have been put in place and carefully levelled, keys or wedges are driven into the gains, and the whole foundation is thus firmly fastened together.

Some 20 feet back of the main sill, *O*, is placed the engine block, *m*, which needs to be firmly fastened, and generally a heavy beam, *l*, eight or ten inches square is fastened between the engine block, *m*, and the mud sill, K^5, or the end of the main sill, *O*.

Great solidity and freedom from vibration are the objects to be attained.

SAMSON POST, JACK POST AND SAND REEL SUPPORTS.

The samson post, *P*, should be 18 x 20 inches at the bottom, and 18 inches square at the top, and 13 feet high, dovetailed into the main sill, and held by properly fitted keys, and braced by the braces, *P*, which are all set in gains and firmly keyed up.

The jack posts, *Q* and Q^1, should be of hard wood, four feet high and 16 inches square.

The knuckle post, *R*, should be of hard wood, 16 inches square and three feet high. Its shape is shown in diagram II. It is keyed in a gain in the main sill, *O*, and the lever, *r*, is pivoted in it. The lever, *r*, should be of some tough and elastic wood. When pulled forward it holds the sand reel pulley, T^1, against the band wheel, *S*, and when pushed back it holds the brake pulley, *T*, against the back brake.

The jack posts, *Q* and Q^1, are dovetailed into their appropriate sills, and held by firmly driven keys, and the jack posts are braced in the same manner as the samson post. The rear jack post, Q^1, has a long brace, *i*, from its top to the first beam, *H*, of the derrick.

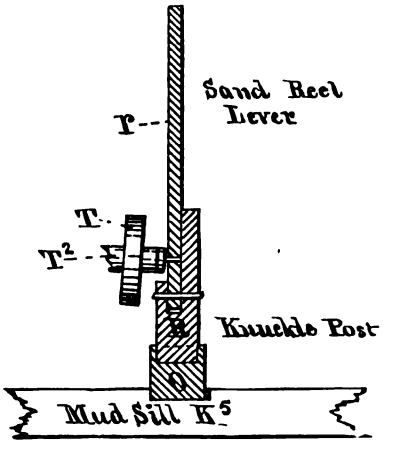


DIAGRAM II.

WALKING BEAM, BAND WHEEL AND SAND PUMP REEL.

The walking beam, *U*, is of the shape shown in figure 1. It is 26 feet long, 12 x 26 inches at its middle, where it rests on the saddle (figure 47), and is bevelled on its lower side to twelve inches square at its ends. At its front end, a slot two inches wide and ten inches deep is cut, in which the drilling hook, z^1 (figure 49), is hung. The slot is well shown in figure 29. The hook is set six inches from the end. The stirrup, *v* (see figure 46), of the pitman, *V*, is hung six inches from the other end. As six inches are thus taken from each end of the walking beam, *U*, its effective length is 25 feet, which is the distance from the centre of the jack post, *Q*, to the well hole, G^1. Midway between these points is the centre of the samson post, *P*.

The band wheel, *S*, is 9 feet in diameter, and its rim is 8 inches wide. It is connected with the pulley of the engine by a belt. It communicates power to all the movable parts of the apparatus. It must be a perfect circle, have a carefully finished face, and be accurately mounted. Various kinds are shown in figures 34, 35 and 36, and a face view is shown in Figure 37.

It is fastened upon a shaft, which has at one end a crank or arm, *O*, with several holes, in either of which (according to the length of stroke of the walking beam desired) is inserted a wrist pin (see figure 45), to which is attached when necessary the pitman, *V*, which is connected by the stirrup, *v* (figure 46), with the walking beam, *U*. The rotation of the band wheel, therefore, causes a rocking motion of the walking beam, *U*.

On the side of the band wheel, *S*, is bolted the tug pulley, S^1, which is lined with the grooved bull wheel, *M*, in the derrick.

The common sand reel shaft is twelve feet long and ten and a half inches in diameter. It has both a brake pulley, *T*, and a friction pulley, T^1.

Great care must be taken in hanging the sand reel, so that the bearing of the friction wheel, T^1, is even with the face of the band wheel. The lever, *r*, is pivoted in the knuckle post, *R*, about 12 inches above the main sill, and in the lever, *r*, is placed the gudgeon of the sand reel, about 12 inches above the pin of the lever (see diagram II).

A stick fastened on the centre of the sand reel shaft, T^2, at right angles to it, is lined with the sand pump pulley block, *t*, near the top of the derrick. This gives the proper angle of the sand reel shaft, the back end being raised or lowered as may be required for the sand pump rope to distribute itself evenly from end to end of the shaft.

THE DERRICK AND ITS FITTINGS.

The derrick, *A*, stands directly over the well, and is 20 feet square at the base, and 72 feet high, the four corners, *E*, converging so as to form a square at the top two feet ten inches inside diameter, upon which rests a heavy frame work, *F*, for the reception of the crown pulley, *x*, over which the cable or drill rope plays (see diagrams III and IV).

The foundation posts, *J J*, support the derrick, *A*. Of these there are six, one at each corner and one midway between the corners on each of the two sides. These posts may be 18 inches square, and should be set firmly in the ground.

The two derrick sills, *C C*, are on each side of the derrick and rest upon the foundation posts. They should be 21 feet long and 10 inches square. On top of these sills are laid from side to side the floor sills, *H H*, which are 8 x 10 inches and 20 feet long. Of these there are six, the two middle ones being one foot apart, and having the well hole, G^1, between them. They are raised by blocking from the sills, *C C*, two or three inches, causing the floor, *G*, to slope both ways from the centre, so that it can be more easily kept clean.

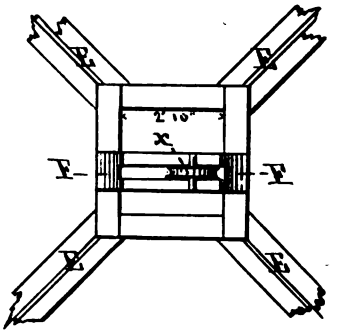


DIAGRAM III.

The floor sills, *H*, are bevelled at the corners to the slope of the derrick, and the corners started, the planks of which on the sides are 2 x 8 inches. Of these there should be sixteen pieces, each 16 feet long, and four pieces 10 feet long. The planks used on the ends are 2 x 10 inches, of which there are fourteen pieces 16 feet long, and four pieces 18 feet long.

In erecting the corners four pieces 10 feet long, 2 x 8 inches, are spiked to the bevelled ends of the sills, *H*, then the 18-foot lengths, 2 x 10 inches, are raised and spiked to the sills and also to the 10-foot lengths, thus forming a corner, as illustrated at *E* in the ground plan.

The lower girths, *B*, of the sides are then nailed in position, the centre line of the girths being in line with the top of the 10-foot lengths; the girths, *B*, and braces, *D*, being on the inside of the derrick.

The first row of girths, four in number, are of plank, 2 x 12 inches and 20 feet long. Planks for scaffolding are laid on these girths. The next set of uprights are raised, 16 feet long, and spiked to the upper portions of the 18-foot lengths. The second row of girths are put on, their centre line being at the upper ends of the 18-foot lengths. This makes the distance between the first and second rows of braces 8 feet, and as 16-foot lengths of both sizes are used up to the top or eighth girth the distance between the centre line of the several rows of girths will be 8 feet. From the eighth girth the 2 x 10-inch sides will require an 8-foot length each, and thus the proper height for the corners will be reached.

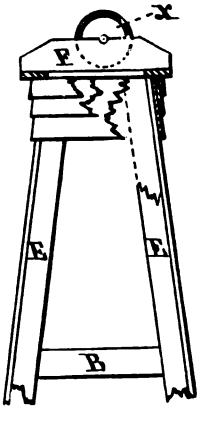


DIAGRAM IV.

The top is formed of boards of three different widths, the first row, 18 inches wide, is nailed to the sides of the corners, the upper edge being even with the top of the corners. On the outside of this row is nailed, with the upper edge flush, a row of pieces, 12 inches wide, and in the same manner is nailed a row of pieces, 6 inches wide.

On the top parallel with the ends of the derrick are fastened two pieces of 2 x 12-inch planks on which the crown pulley block, *F*, rests.

The several rows of braces, *D*, are put in place as fast as the girths are raised, excepting between the first and second rows of girths on the end nearest the samson post, where the braces are left in order to allow the walking beam, *U*, to have free movement. At this part of the derrick two planks, 20 feet long, are used as braces (see diagram V); they are placed diagonally from the corners of the derrick to the second row of girths, their top ends being fastened one foot apart.

The second girth is sometimes cut through in order to allow the walking beam, *U*, when not in use, to stand in the position shown in figure 1, and sometimes it is raised a foot above the line of the other girths.

At the bottom of each side at the corners is spiked a 2 x 10 inch plank, 20 feet long, called a doubler or strengthener.

The sides of the ladder are formed of two pieces of 2 x 4-inch scantling; the steps are of boards, five inches wide and two feet long.

At the bottom of the derrick is the shaft, M^2 (see figures 13 and 30, and diagram VI), 13 feet long and 13½ inches in diameter, mounted on journals, and having on each end the bull wheels, $M\,M$, 7½ feet in diameter, between which, on the main shaft, M^2, is coiled the drilling cable, X, the outer end of which cable, X, passes under the shaft, M^2, over the crown pulley, x, at the top of the derrick, and is firmly attached to the drilling tools, Y. When these are to be withdrawn it is done by power applied to the bull wheel.

The bull wheel posts, M^1, should be of heavy, sound timber, of hard wood, at least ten inches square and 11 feet long. They are cut one-half way through about one foot from their lower ends (see diagram VI). This is dressed out, leaving an extended tongue, permitting the bull wheel posts, M^1, to set in on the derrick sill, and the tongue is bolted to the sill. The upper ends of the posts have tenons formed on them parallel with and resting against the lower girth.

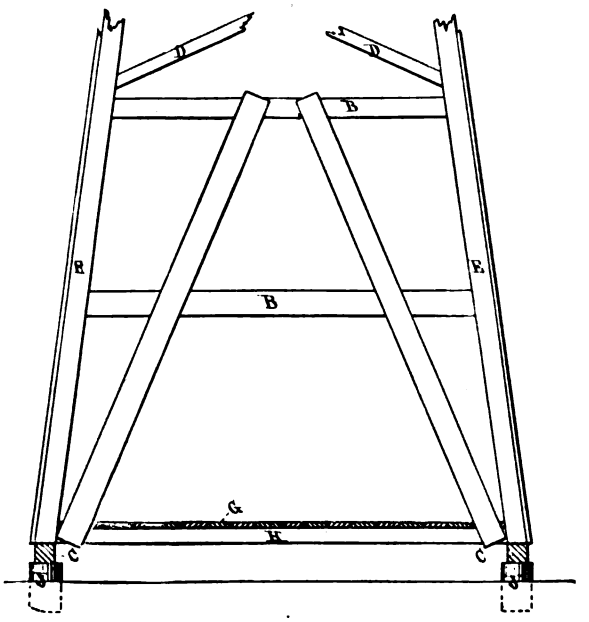


DIAGRAM V.

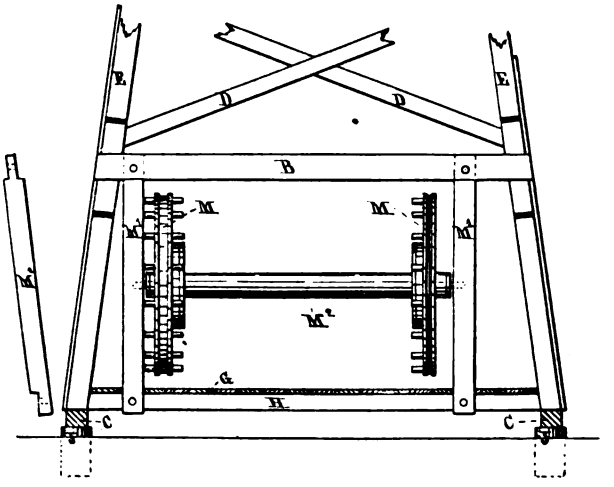


DIAGRAM VI.

A short piece of 2-inch plank, say one foot long, is spiked at each corner at the back end of the derrick, over the first girth, and to these is spiked a plank overlapping the first back girth forming a recess four inches in width for the tenons of the bull wheel posts, M^1. The front post is set as near the front side as the slope of the corner will permit, and the back post is set the length of the bull wheel shaft from the front post. Holes are bored in the posts to receive the gudgeons of the bull wheel (figure 48). These should be about six inches higher from the derrick floor than the diameter of the bull wheel. After the bull wheel is swung the posts are fastened at the bottom and the top by bolts. And the back post is also strengthened by a brace from its top by a plank or beam, L, to one of the middle joists of the derrick. This brace is shown perspectively in figure 13.

The gudgeons of the derrick or crown pulley (figure 51) are set four inches from the centre of the top of the derrick toward the bull wheel end. As the crown pulley is 18 inches in diameter, this causes the groove of the crown pulley to be five inches from the centre of the derrick toward the samson post.

ENGINE HOUSE AND BOILER HOUSE.

These need not be particularly described, as they do not differ from ordinary constructions for such purposes.

One house may contain both engine and boiler. The engine should be at least 33 feet from the band wheel.

In winter the whole rig is enclosed so as to protect the workmen and machinery (see figure 3).

THE ENGINE, BOILER AND CONNECTIONS.

An engine for drilling an artesian well (figure 100) should not be less than fifteen horse-power, having a cylinder at least nine by twelve inches, although smaller engines, in good hands and under favorable circumstances, can be used.

The boiler (figure 105) to supply the steam to the engine should not be less than twenty horse-power.

The engine, *n*, is securely fastened to the engine block, *m*, and by means of its driving pulley and carrying belt, *j*, which is of four or five-ply rubber eight inches wide, motion is communicated to the band wheel, *S*, and through it to all other parts of the machinery.

The motion of the engine is under the control of the driller in the derrick, for the throttle valve of the engine has a large grooved wheel (figure 249) attached to it, and from this grooved wheel the endless cord, *b* (called the "telegraph"), extends to the derrick and passes around another grooved wheel, b^2, which may be fastened to the headache post, *w*, or some other convenient point within easy reach of the driller.

The link of the engine by which its motion may be reversed at will, can also be operated from the derrick by the cord, a^1, which passes over two grooved wheels (figure 248), one fixed above the engine and the other in the derrick, a^2. A pull upon the cord, a^1, raises the link and reverses the driving wheel of the engine. When the cord, a^1, is slackened the link drops by its own weight, and the ordinary motion of the engine is restored.

Power from the engine, *n*, is applied by means of the belt, *j*, to the band wheel, *S*, on the side of which is bolted the tug pulley, S^1, which has a groove, in which the bull rope, *f*, rests. On one of the bull wheels, *M* (the right-hand one in diagram VI), is a similar groove. The bull rope, *f*, passes from *M* to S^1, and by the rotation of the band wheel, *S*, power is thus communicated to the bull wheel, *M*, and the tools can be withdrawn. In order to give motion in proper direction to the bull wheel, *M*, the bull rope, *f*, is always crossed. When the tools are lowered into the well they descend by their own weight. In order to check the rapidity of their descent the other bull wheel is provided with a brake *g*, which consists of a strap of iron (see figure 70) firmly fastened by a strong staple (figure 72) to the derrick floor, and passing over the bull wheel, *M*, is so united to the brake lever, *h* (figure 71), that pressing down upon said handle will cause the brake band, *g*, to clasp firmly around the bull wheel. See figure 13, where the brake is shown on the right-hand wheel.

The headache post, *W*, is a strong post placed directly under the walking beam, so that in case the pitman, *V*, or saddle, *k* (see figure 47), should break, the front end of the walking beam would drop upon it, and thus be prevented from falling on the head of the workman, or doing other damage. If any repairs are needed to the crank or pitman, the walking beam can be tipped down and rested upon this post, or a block can be placed upon it, and the walking beam wedged up, if it is ever necessary to relieve the pitman of the weight of the tools while drilling.

The derrick floor requires 400 face feet (800 feet board measure) of two-inch plank.

The sand reel handle, *N*, is set near the headache post, *W*.

Attached to the derrick floor near the grooved bull wheel, *M*, is a block swinging on a pivot having a projecting pin at one end, and at the other a cord long enough to reach to the man at the brake. The lever is so arranged, that a pull upon the cord will swing the pin against the bull rope and throw it off the pulley. It is shown in figure 13, though partly obscured by the brace of the bull wheel.

THE DRILLING TOOLS.

These are shown in detail in figures 115 to 122, and are—

1st, Y^1 Rope Socket (figure 115) three feet long, weighing ..... 90 lbs.
2d, Y^2 Sinker Bar (figure 117) twelve feet long, weighing..... 400 lbs.
3d, Y^3 Jars (figure 119) six feet long, weighing..... 300 lbs.
4th, Y^4 Auger Stem (figure 118) 32 feet long, weighing..... .....1050 lbs.
5th, Y^5 Bit (figure 120) three feet four inches long, weighing..... 140 lbs.

These are screwed together, forming the "string" of drilling tools. The sinker bar and auger stem are made of 3½-inch iron. The jars have a play of nine inches, and are 5½ inches in diameter.

6th, a pair of Wrenches (figure 122). These are 3½ feet long, and weigh 75 lbs. each.

7th, Temper Screw *Z* (figure 116).

8th, a Bailer or Sand Pump *d* (figures 225 to 230).

Drilling tools are generally made with 2⅝-inch pins three inches long, eight threads to the inch.

THE TAPER JOINT FOR OIL-WELL TOOLS.

This was patented by J. L. Alexander, and is very superior to the ordinary straight joint, and adds but a few dollars to the cost of a set of tools. It is shown in figure 125. Its pin and box being tapering, more than double the strength is added at the base of the pin, which is the place where strength is required. As the pin enters half-way into the box before the threads engage, it takes but half the number of turns to screw a joint together that is required in the ordinary joint. As the bit must be unscrewed and replaced several hundred times in drilling each well, the saving of labor and time is, in the aggregate, considerable.

ROPE SOCKET.

There are several different kinds. The more common is the wing rope socket (shown in figure 115), in which the end of the drilling cable, after being strained and wrapped, is firmly riveted with three half-inch rivets.

The kind now preferred is figure 134, which is bored through with a taper, largest at the bottom. The end of the cable is put through from above, its end unwove and the strands firmly knotted together and wrapped so as to densely fill the lower portion of the taper. This gives a strong and reliable connection that can be made by the most unskillful.

THE SINKER BAR.

This gives force to the blow upward when necessary to "jar" to loosen the bit, when fast. It must never be allowed to strike downward.

THE JARS.

These are made in two parts, and are like two long links of a chain. Both parts are slotted, and the cross head of one passes through the slot of the other.

When extended the jars are six feet long, and when closed five feet three inches. The difference, nine inches, is the play of the jars. The function of the jars is to give a blow upward.

If the auger stem were attached directly to the sinker bar it might stick in the rock so that it could not be drawn out, but an upward blow will loosen it, and this blow the jars give.

Formerly a jar of about four inches was given at every stroke in drilling, and although skillful drillers no longer employ it habitually, we will describe it in order to make more clear the present method. Suppose the vertical movement of the walking beam to be twenty inches. When it starts upward the sinker bar and upper wing of the jars would rise four inches, until the two parts of the jar would strike. Then the auger stem and sinker bar would rise the remainder of the stroke, or sixteen inches. On the down stroke the auger stem and bit would fall sixteen inches, while the sinker bar would fall twenty inches. An upward blow would thus be given at every stroke.

But the best drillers now drill by the spring of the cable, and the "jar" is used only when the bit sticks. No matter how firmly the bit is "stuck," it can be soon knocked loose by the jars if they are free to work.

The tools hang from five inches to three feet above the bottom of the hole, the distance depending on the length and consequent spring of the cable. When motion is given to the walking beam, the tools rise and fall in the hole. Their weight stretches the cable until they touch the bottom and bound from it. They therefore give a quick and rebounding blow. This is called "bouncing" the drill, and it cuts the rock much faster than the old method, but it is more destructive to cables, jars and band wheel shafts.

The temper screw (figure 116) makes the connection between the walking beam and the cable, and it is gradually let out as the bit cuts into the rock. It is hung on the drilling hook (figure 49) by the eye at its upper end, and the clamps at its lower end are fastened to the cable. When let out its full length it reaches from the walking beam, when at its lowest point, to very near the mouth of the well.

The screw is five and one-half feet long, an inch and a half in diameter, with square thread, two threads to the inch.

The wrought iron reins are one and a half by five-eighths inches, and five and a half feet long. The nut at the lower end of the reins is cut in two; a band with a set screw encircles this divided nut, and is riveted to one-half, the set screw pressing against the other half. The reins are constructed so as to spring apart and free the nut. If the driller wishes to pay out the temper screw, he loosens the

set screw, revolves the temper screw, and thus lengthens it, and by tightening the set screw he prevents it from lengthening.

When the screw is all run out, and disconnected from the cable, he loosens the set screw so that the nut flies open and leaves the long screw free. It can then be pushed up, and the nut tightened. This is aided by a counterpoise which is equal in weight to the screw and clamps, and is hung on two cords, which pass over pulleys on the walking beam, and are attached to the bows of the swivel shown at the upper end of the screw (figure 116). One of the pulleys is above the samson post and the other two are on each side of the drilling hook. The counterpoise moves along the samson post, and the cords have separate pulleys above the temper screw, but both go over the same pulley at the samson post. The use of this counterpoise is covered by one of our patents.

The temper screw shown in figure 116 is made under the Downing patent (exclusively by us and our licensees). It has a swivel between the temper screw and the clamps, and so superior is it to all others that it is the only kind now used.

BAILERS OR SAND PUMPS.

Of these there are several kinds. The most commonly used are those patented by Roberts, Morahan and Smith, which patents we own. The Roberts patent bailer (figure 230) is made of wrought iron with a bail (figure 232) at the top, and a foot valve (figure 234) at the bottom. It is 18 to 20 feet long. The valve stem projects downward below the pump, so that the valve may be opened, and the contents of the pump discharged by resting the stem on the ground.

The Morahan Patent Sand Pump (figure 225) is made of iron pipe five feet long. It has a suction valve on the end of a plunger (figure 229). The sand-pump line is fastened in the eye at the top. When the pump stops at the bottom of the well, the plunger descends to the bottom of the pump. The leather valve is so constructed as to go down in the pump readily, but on pulling back it flattens, and becomes a tight piston. When the line is pulled up, the valve and plunger are pulled through the pump, sucking in the débris from the bottom, the lower valve closes and retains the contents. If it should get fast in the well it can be "jarred" out.

The Smith patent (figure 226) is a combination of the Morahan and the Roberts pumps.

After a hole is "cased," as will be hereafter described, and the surface water shut off, it is necessary to pour in water for the tools to work in, to float the débris made by the bit. The water rises to about the jars and holds in suspension all the drillings. A bailer is used to take this water out, which it does effectually; but in a wet hole full of water a bailer would fill with water before it reached the bottom, and would take up comparatively little of the muddy water. In such cases the Morahan or Smith sand pumps are used. As all wells are drilled "wet" for several hundred feet, an outfit should include both a Roberts bailer and a Morahan sand pump.

COMMENCING THE WELL.

The operators on a well consist of four men—two drillers and two tool dressers. One of each work together from twelve at night to twelve at noon, making what is known as the morning tour (always pronounced "tower" in the oil regions). The others make the afternoon tour, from noon to midnight.

When the walking beam is mounted, and the drilling hook hung, a plumb line is let fall from the hook, and it will mark the centre of the well hole, G^1.

If the earth is firm a hole twelve inches in diameter is "spudded," by means of the spudding bit (figure 133). A wooden conductor made in an octagon form, as shown in figure 260, is inserted to the rock. This prevents the surface earth from caving into the well.

If, however, the bed rock is at such a distance below the surface, or if the surface soil is of such a nature that it is not practicable to "spud" a hole for the conductor, the bed rock is reached by drive pipe, which is a heavy iron pipe, commonly eight inches in diameter on the inside, armed at its lower end with a steel shoe (figures 263 and 264). This is driven through the surface soil by means of a heavy maul, similar to the manner in which piles are driven by a pile driver (see figure 12). The pipe, while being driven, has a heavy iron cap (figure 262) to prevent injury by blows of the maul.

The maul is made of a sound log from 15 to 20 inches in diameter, and from 12 to 15 feet long. Two opposite sides are smoothed, the lower end is cut off square and dressed in a circle, and a heavy iron ring is shrunk on it to guard against splitting. In the other end is fastened a heavy staple. Two wooden pins are driven in near the top, and also near the bottom of each squared side. They are two inches apart and project two inches. They fit each side of the guides, and serve for grooves.

A line is drawn on the derrick floor through the centre of the well, at right angles to the walking beam, and plank two inches thick are placed on that line perpendicularly, and carried up in the derrick five feet higher than the length of the maul and of a length of drive pipe. Great care should be taken that those guides are truly vertical. They should be placed as far apart as the thickness of the maul; planks are spiked on each side so as to allow the centre one to project about two inches, and enter between the pins on the maul. They must be securely braced at the bottom, and from the sides of the derrick. A short cable 150 feet long is fastened to the bull wheel shaft, M^2, carried over the crown pulley, x, and tied to the staple in the end of the maul. A rope is fastened to the wrist pin, and tied loosely around the cable, as shown in figure 12. The engine is started, and every revolution of the crank twitches upon the cable and raises and drops the maul. As the pipe is driven down the operator at the brake lets out more rope as needed. When the pipe is driven to the rock it is cut off square at the derrick floor.

As the drilling tools are about sixty feet long they cannot be operated in the regular way until the hole is deep enough to allow them to sink beneath the derrick floor. The first sixty feet are "spudded."

The end of the short cable used in driving pipe is disconnected from the maul and attached to the swivel box (figure 131), to which is attached the sinker bar (figure 117), or the auger stem (figure 118) and a bit (figure 120). Water is poured in to float the mud, and the bit is raised and lowered the same as described for the maul. The sand pump is used to clean out.

Sometimes the drill and the maul are worked alternately, as it much facilitates the driving of the pipe to have it cleaned out, and to have the earth loosened in advance of the pipe. In such cases the guides of the maul are cut at a proper height and hinged, so that they can be thrown up out of the way when the drill is used.

In case a buried boulder, or other large rock, is encountered before the bed rock is reached, such rock is drilled through by the drilling tools, and the drive pipe can be afterward driven through the hole thus formed. By means of the Clary bit shown in figure 210, the hole may be enlarged below the drive pipe.

When the bed rock is reached the hole is drilled into it a few inches, and the drive pipe firmly driven in, so as to form a tight union, in order that no surface water can leak, or dirt get into the well.

As soon as the hole is deep enough to "bury" the tools, the cable is coiled upon the bull-wheel shaft, and its end united to the tools, which are swung up in the derrick. The tools are then lowered into the hole.

The temper screw (figure 116) is closed up and attached to the drilling hook. The pitman is connected to the wrist pin of the crank. The cable is carefully wrapped, and the clamps of the temper screw are firmly fastened upon it, the cable is slackened off from the bull wheel, and the tools hang in the well suspended from the walking beam.

The engine is started and the tools will rise and fall with each rotation of the crank. The driller turns the clamps (which are united to the temper screw by a swivel) round and round until the slack of the cable is coiled several times around the straight cable below the temper screw. He then reverses the motion, uncoils it and recoils it up the other way, and again and again. This rotates the drill, and this is kept up constantly while the drilling goes on. As the drill penetrates the rock, the operator loosens the nut of the temper screw (figure 116) and feeds it out gradually, until it is at its extreme length. When the screw is all fed out, a new hold of the cable must be taken by the clamps with the screw closed.

When the tools are to be drawn, the bull rope is thrown on the bull wheel, and the driller stands at the brake, and his assistant (the tool dresser) at the engine. The bull wheel revolves and draws up the slack of the cable, and just as the rope tightens and commences to lift the tools, the engine is stopped and the brake set.

The clamps of the temper screw are thrown off the cable, the pitman is disconnected from the walking beam and lowered to the main sill. The engine is started and the tools drawn from the hole. When the top of the bit appears the engine is stopped, a wrench (figure 122) is put on the squared portion of the bit (figure 120) just below the collar, and another wrench on the squared part of the auger stem (figure 118) just above the box. A bar is inserted in one of an arc of holes in the wrench circle (figure 139), which is firmly fastened to the derrick floor, and the united strength of both men applied to the lever will start the joint so it can be unscrewed by hand. (The joints are always "set up" by the same leverage, that no risk may be run of their unscrewing in the well.)

The engine is again started, and the tools drawn entirely out from the hole. When the bit is entirely out the assistant stops the engine, and the driller applies the brake to the bull wheel. The

tools are swung out of the way of the sand pump, and the sand pump or bailer is run. The bit is unscrewed, and is dressed or sharpened (see figure 13), and carefully dressed out to the size of the gauge (figure 123), and one is screwed on ready to drill again.

The sand pump is placed in the well, down which it runs by its own weight, and is withdrawn by pulling upon the lever, *N*, and thus holding the friction pulley, T^1, against the face of the band wheel, *S*.

At any time, either in its ascent or descent, the rate of speed of the sand pump can be checked or stopped by pushing the lever, *N*, and throwing the brake pulley, *T*, against its back brake. The sand pump is run one or more times, until the débris made by the drill is removed.

The sand pump is stood to one side, as in figure 1, or put under the bull-wheel shaft, as in figure 13, and the tools are allowed to drop a little way into the well. The joint between the bit and auger stem is carefully tightened, as before described, the wrenches taken off and the tools lowered, their rapidity of descent being controlled by the brake, *h*. Connections are made as before, and drilling resumed.

While the driller is rotating the tools, his assistant dresses the worn bit. For this purpose he has a blacksmith's forge, which is generally erected (as shown in figure 13) at one side of the derrick.

A rope is tied on the walking beam, which passes up to a pulley (figure 245) in the derrick, and down through a pulley (figure 245) fastened to the floor near the bellows (figure 247), and is then looped over the bellows handle. The motion of the walking beam blows the bellows. When the forge is not in use the rope is slipped off the bellows handle.

The cut (figure 1, side elevation) represents the well when the tools have just been drawn from the hole.

The next step will be to throw off the tug rope, *f*, from the bull wheel, swing the lower end of the tools to one side of the derrick, and hook them there so that they will be out of the way, and lower the sand pump, *d*.

When the tug rope, *f*, is thrown off from the bull wheel, it remains loosely on the grooved pulley, S^1, and its bight lies over the bull-wheel shaft between M^1 and *M* (the upper one as shown in the ground plan, figure 2). There is so little friction upon it that it remains upon its pulley, S^1.

The sand pump, *d*, will be run down into the well and withdrawn and emptied several times.

When the well is sufficiently cleaned of débris by the action of the sand pump, the tools are lowered into the well, the clamps are fastened to the cable, and the drilling is resumed.

METHOD OF CASING OIL WELLS.

In the Oil Regions of Pennsylvania and New York there are many seams of fresh water intersected by the drill before the oil rock is reached. If this water is not cut off from the well it will fill the hole, and when the oil rock is reached its hydrostatic pressure (sometimes over 600 pounds to the square inch) will drive the oil away, and the cold water will throw down a precipitate of paraffine, clogging up the pores of the rock.

In salt wells the fresh water will dilute the salt water.

In wells sunk for water, sometimes the upper seams are foul or charged with minerals, and their presence will contaminate the purer waters below.

Formerly the practice in Pennsylvania was to allow the water to remain in the hole until the oil rock was penetrated. Tubing was then inserted in the well, and upon that tubing, at a point which would rest below the lowest water veins, a "seed bag" was placed. This was a round cylinder of leather (like the leg of a boot) made the size of the hole, firmly tied below, filled with flax seed, carefully rounded to the size of the hole, and loosely tied at the top. When this was put in and lowered to its place, the water soaking through the pores of the leather would swell the seed, and press the bag firmly against the sides of the well. When the water below was pumped out, the water above the seed bag was effectually prevented from getting down to the oil rock.

Seed bags are no longer used, the patent packers shown in figures 400 to 403 having entirely superseded them.

But since 1870 nearly all oil wells have been drilled as shown in detail in figures 25 to 29.

The drive pipe, eight inches inside diameter, is driven down to the bed rock. The well is drilled eight inches in diameter down below the lowest fresh water seams. Casing, 5⅝ inches inside diameter, is then inserted and adjusted water-tight upon the rock.

After casing the 8-inch bit is removed, and the 5½-inch bit substituted, and the well drilled that size as far as desired.

The sand pump soon removes all water from the hole, and therefore water must be poured in for the drilling tool to work in.

The well is then practically dry, and drilling is much more rapid, and there is much less danger of the rock's caving than in wet holes.

The drilling is carried on continuously, from Sunday at midnight to Saturday at midnight. Before leaving the well on Saturday night, the driller attaches to the sand pump line the casing tester, figure 288, and lowers it into the well below the casing. The casing tester is a small tin pail with a rubber flange at the top, which fits closely to the hole. It is left 24 hours in the well, and it collects any water that leaks through the casing. It is withdrawn from the well at midnight on Sunday, and if it contains any water, that indicates that the casing is not tight. If necessary, the casing is withdrawn, and again replaced so as to be water tight, but generally some débris from the sand pump poured around the casing will effectually tighten it.

MEASURING THE WELL.

While the well is being drilled, and especially when completed, it should be measured. The devices shown in figures 290 to 293 are made for the purpose.

Figure 290 is the popular McClure reel, which can be readily fastened in an auger hole in any of the uprights of the derrick. Its line is a flat steel tape, accurately marked every fifty feet. The brake by which its motion is regulated is very ingenious and efficient. Nothing can exceed its neatness and reliability.

Figure 292 has a round steel wire likewise marked in fifty-foot sections.

Figure 291 is to be held by the hands against the cable while the cable is being drawn from the well, and the revolutions of the grooved wheel are accurately registered upon the dial.

Either 290 or 292 can be mounted on the tripod shown in figure 293.

TUBING.

When the well is completed, it is tubed. A casing head is screwed on the end of the casing. There are different kinds of heads, which are shown in figures 277 to 281. The common one is figure 277. The way in which it is used is shown in figure 29.

The tubing is two inches inside diameter, and it extends from the bottom to the top of the well, the lower section (called the anchor) being perforated, as shown in figures 27, 28, 29 and 305, to admit the oil or an Innis Patent Flower (figure 425) is inserted, in place of a coupling, between two sections of tubing.

The tubing is in lengths of from 18 to 20 feet, screw threaded at each end, and a coupling, such as shown in figure 300, unites two lengths. A standard length of tubing, as sold, has a coupling at one end; short pieces, when cut to order, do not have couplings.

Tubing is put in and taken out of the well by patent elevators. None are made except under patents owned by us. The principal ones are the Fisher, figure 313, and the Fair, figure 314. A pair (two) are required.

The manner of tubing a well is as follows: A tubing line 240 feet long is carried over the crown pulley and fastened to the beam at the top of the derrick. The bight is dropped down to the floor. The end is fastened to the bull wheel shaft.

A snatch block, figure 312, is placed on the bight of the line.

A piece of tubing is placed in the well hole, with the coupling up, and under the coupling is clasped the elevator. This will prevent the tubing from falling into the hole. The other elevator is clasped under the coupling of another piece of tubing, and the hook of the snatch block is inserted in the bails; a pull upon the line hoists it in the air, and its threaded end is suspended over and then lowered into the coupling. One workman holds the lower coupling with a pair of tubing tongs. Another workman, with a similar pair of tongs, screws the tubing into the coupling.

Our Lay Patent Tubing Tongs, figure 315, are the best for the purpose. The superiority of the Lay Tongs is in the four-cornered steel bit, which has four sharp edges, and which can be removed when one edge is worn and replaced with a sharp edge uppermost, and when all are completely worn out, a new bit can be substituted at trivial expense.

When the second joint is made fast to the first, one workman takes his place at the brake. The tubing is hoisted a trifle, so as to take its weight off the elevator; the elevator is opened and taken off. The tubing is then allowed to slowly descend by its own weight until the elevator checks it at the well's mouth. The hook is then detached and the first elevator is united to another piece of tubing, which is placed on the tubing already in the well. This operation is repeated until all the tubing is inserted.

The upper length of tubing is cut to such a length that its coupling shall rest upon a ring which fits over the casing head cap. This ring appears in figure 29. The ring and casing head cap are put on the last piece of tubing which goes into the well, before it is screwed on. The connections of the tubing above ground are made as required to conduct the oil to the tank. Some operators have their tubing entirely supported by the tubing ring, and others have the tubing rest on the bottom and the weight is partly supported by the ring.

An oil well may flow spontaneously or it may require pumping.

The arrangement of a flowing well is shown in figure 15 and figures 24 to 27. Some wells will flow through the casing alone, but generally the wells must be packed around the tubing near the oil rock, so that the gas is confined and forced to go through the tubing. This is done by means of a cylinder of rubber nearly as large as the hole, placed between two flanges on the tubing, between which flanges is a slip joint. The tubing must rest upon the bottom of the well and the weight of the tubing above the slip joint pressing upon the rubber distends it against the sides, thus forming a gas-tight and water-tight packing around the tubing at that point. There are several different forms of packers, which are shown in figures 400 to 403, the best being the Eaton Packer, figure 401, made under one of our patents. Packers are sometimes used to cut off from the lower part of the well any water that comes in below the casing.

If the well has not sufficient force of gas to cause it to flow it must be pumped.

A packer is not generally used on pumping wells, but at a point on the tubing above the perforated anchor a working barrel is united to the tubing, as shown in figure 24. Various forms are shown in figures 360 to 364. They are screw-threaded, so as to be united to the tubing, of which they form a part. As in other pumps, two valves are provided, one stationary at the bottom of the working barrel and the other movable therein. Forms of the valves are shown in figures 375 to 380. The valve is a ball, figure 385, and it has a steel seat, figure 381.

The upper, movable or lifting valves are shown in figures 375 to 378. The common valve, as shown in figure 375, has a series of leather cups, shown separately in figure 383, which are pressed by the weight of the column of fluid against the sides of the working barrel. Some wells pump considerable sand, which rapidly cuts out the cups. In such cases the rope valve, figure 377, or the Lewis Patent Valve, figure 378, or the Snow or Plunger working barrel, figures 362 to 364, are employed.

The upper valve is united to a valve rod, figure 347, and this is connected to a string of wooden sucker rods, figures 322, with iron joints, which extend to nearly the top of the well, where they connect with the polished rod, figure 344. The polished rod passes through a stuffing box, figure 346, at the top of the tubing, and is united to the walking beam by the adjuster, figure 340. There are two forms of adjusters, both made under patents owned by us. The most popular form is the Lewis adjuster, figure 340. The adjuster fits in a semi-circular grove on top of the working beam, and is covered by the adjuster board, figure 345, which is firmly held to the walking beam by the T bolt, figure 348. The motion of the walking beam, therefore pumps the well.

On many wells a Crocker check valve, figure 387, is used. This relieves the working valve from the weight of the column of fluid during the descent of the valve, and causes the well to pump with a steadier motion.

The arrangement of a tubed well, ready for pumping, is fully illustrated in figures 14 and 29.

MATERIAL REQUIRED TO DRILL DEEP WELLS.

The following is a complete list of the material required to drill a well over 1,000 feet deep, and fit it up ready for pumping, as it is done in the Oil Regions of the United States.

We include the wheels, derrick irons, nails, etc., to put up the derrick. We also include a few of the most necessary fishing tools, and common tools, which will be found indispensable around the derrick :

One Set Bull Wheels, figure 30, and Band Wheels with Tug Pulley, figure 34, ready to be set up.
One Complete Rig outfit, as follows; Shaft, Crank, Collar, Wrist Pin, and Pair of Flanges, with Keys and Bolts, figure 45.
One Set of Centre Irons, figure 47.
One Stirrup, figure 46.
Two Gudgeons and four Bands, figure 48.
One each, Derrick and Sand Pump Pulley, figures 50 and 51.
One Common Sand Pump Reel, figures 38, 39 or 40.
One 5-inch Brake Band, Lever and Staple, figures 70, 71 and 72.
One Back Brake, figure 73.
2½ Kegs Nails, assorted.
Six ¾ Bolts, assorted.
Eight ¾ x 16 Bolts for wooden boxes.
One Drilling Hook, figure 49.
One 20 Horse-power Boiler, figure 100.
One 15 Horse-power Engine, figure 105.

Extra Pipe, Fittings and Connections to set Boiler and Engine, also for Tank, as follows:

Six each, 1-inch Nipples, figure 516, long and short.
Six each 2-inch Nipples, figure 516, long and short.
Two 2-inch Flange Unions, figure 512.
Four 1-inch Unions.
Nine each 2-inch Ells and Tees, figures 505 and 506.
Five 2-inch Plugs, figure 515.
Twelve 1-inch Ells, figure 505.
Nine 1-inch Tees, figure 506.
Five 1-inch Plugs, figure 515.
Two 1-inch Check Valves, figure 556.
Four 1-inch Globe Valves, figure 550.
Two 2-inch No. 1 Iron Cocks, figure 701.
One 1¼-inch x 1-inch Bushing, figure 514.
One Reverse Cord, b^1, figure 1.
One Telegraph Cord, a^1, figure 1.
One hundred and fifty feet 2-inch Pipe.
Ninety feet 8-inch 5-ply Belting, *j*, figure 1.
One Pair Belt Clamps, figure 77.
One Pair Bull Rope Couplings, figure 74.
One Bull Rope, 2⅛-inch x 85 feet, say 125 lbs.
One Cable, 1⅞-inch-x 1,000 feet, say 1,275 lbs.
One Sand Line, ⅞-inch x 1,100 feet, say 310 lbs.

DRILLING TOOLS.

One 3½-inch Auger Stem, 32 feet long, figure 118.
One 3½-inch Sinker Bar, 14 feet long, figure 117.
One Pair Common Jars, figure 119.
Two Large Bits, 8-inch, figure 121.
Two Small Bits, 5½-inch, figure 120.
One Rope Socket, figure 115.
One Temper Screw, figure 116.
Two Tool Wrenches, figure 122.
One Pair Tool Gauges, figure 123.

FOR THE FORGE AND TO USE IN THE DERRICK.

One 5-inch Sand Pump, figure 225.
One Wrought Iron Bailer, 20 feet, figure 230.
One 40-inch Bellows for Forge, figure 247.
One Anvil, say 125 lbs., figure 240.
Two Sledges, 10 lbs. each, figure 243.
One Ball Peen Hammer, No. 70, figure 242.
Two Pair Blacksmith's Tongs, figure 241.
Three each, 3 and 5 inch Pulleys, 245 and 246.
Two No. 2 Telegraph Wheels, figure 249.
One Extra Sand Pump Bottom, figure 231.
One Extra Bailer Bottom, figure 234.
Two Derrick Lamps, figure 244.
Five lbs. Lamp Wick.
Ten lbs. Riveting Iron.

The following fishing tools and extra tools should be included. If there should be any accident or trouble, the want of them would occasion much more expense than the purchase in the outset:

One 3½-inch Sinker Bar, 12 feet long, figure 117.
One Pair Common Jars, figure 119.
One Rope Socket, figure 115.
One Box, figure 127.
One Box and Swivel Eye, figure 131.
One Pin, figure 126.
One Slip Socket for small hole, figure 152.
One Horn Socket for small hole, figure 150.
One Rope Knife, figure 165.
One Collar Socket, figure 160.

DRIVE PIPE, ETC.

Eight-inch Drive Pipe, say 50 feet, figure 261.
One 8-inch Drive Pipe Cap, figure 262.
One 8-inch Drive Pipe Shoe, to screw on, figure 263.

CASING, ETC.

5⅝-inch Casing, say 300 feet, figure 275.
One 5⅝ Casing Head, figure 277.
One Pair 5⅝ Elevators, figure 282.
One Pair 5⅝ Common Tongs, figure 283.

FOR TUBING THE WELL.

Two-inch Tubing, say 1,050 feet (some extra wanted) figure 301.
One Tubing Line 1¾-inch x 240 feet, say 265 lbs.
One 16-inch Snatch Block, figure 312.
One Pair Tubing Elevators, figure 313.
One Pair 2-inch Lay Tubing Tongs, figure 315.
One Pair 2½-inch Lay Tubing Tongs, figure 315.
One Dozen Extra Bits, figure 315.
One thousand feet Sucker Rods, figure 322.
One Sucker Rod Line 1½-inch x 150 feet, say 125 lbs.
One Adjuster, figure 340.
One Adjuster Board and Bolt, figures 345 and 348.
One Polished Rod, figure 344.
One Stuffing Box, figure 346.

One Valve Rod, figure 347.
One Working Barrel, figure 360.
One Set Steel Seated Working Barrel Valves, figures 375 and 379.
50 Extra Valve Cups, figure 383.
One Pair Sucker Rod Wrenches, figure 328.
One Pair Sucker Rod Elevators, figure 326.
One Sucker Rod Hook, figure 327.

MISCELLANEOUS.

Three Sucker Rod Joints, figure 321.
Three Extra Valve Seats, figure 381.
One Tap for drawing Lower Valve, figure 435.
One 250 Barrel Wooden Tank, figure 412.
One 20-Barrel Wooden Tank, figure 412.
One 16-foot Gauge Pole, figure 414.
One Flue Scraper, figure 785.
One lb. White Lead.
Two lbs. Marline.
Five lbs. Hemp Packing.
Six lbs. Rubber Packing.
One Set each, Nos. 1 and 3 Stocks and Dies (to cut threads ¼-inch to 2-inch) figures 717 and 719.
One each, Nos. 1 and 2 Pipe Cutters (to cut off pipe ¼-inch to 2-inch), figure 730.
Six Extra Wheels for Pipe Cutters, two sizes, three of each size, figure 731.
One Bar, ⅞-inch Octagonal Steel.
One No. 1 Combination Vise, figure 761.

For erecting the derrick and around the well, the following articles will be needed, viz. :

Saw, figure 924.
Brace, figure 858.
Expansion Bit, figure 857.
Three Files and Handles, figure 881.
Axe and Handle, figures 852 and 875.
Hatchet, figure 889.
Shovel, figure 929.
Pick and Handle, figures 781 and 876.
Two Wrenches, figures 939 and 942.
Sucker Rod Bit, figure 856.
Auger, figure 854.
One Patent Auger Handle, figure 883.
Five lbs. Babbitt-Metal.
Belt Punch, figure 784.
Two Chisels, figure 866.
Drawing Knife, figure 867.
Hammer, figure 870.
One Keg Assorted Nails.
Ten lbs. Oakum.
Oiler, figure 906.
Cold Chisel, figure 776.
Plumb and Level, figure 914.
Two lbs. Sucker Rod Rivets.
Splitting Chisel, figure 779.
Two Pair Adjustable Tongs, figure 746.
Square, figure 935.
Well Measure 1,500 feet long, and reel, figure 290.
350 feet of 1-inch Pipe for water.

If goods are for shipment to a foreign country, everything except the Boiler, Ropes, Tubing, Casing and Pipe must be heavily boxed.

If two or more wells are to be drilled in the same locality, many of the goods, such as drilling tools, cable and other lines, sand pump and bailer and small fixtures, can be used until worn out.

If two or more wells are drilled, the cost per well will be greatly reduced.

These supplies are for a well 1,000 feet deep. For wells of a greater or less depth, the difference in the cost will be the difference in the quantity of Tubing, Rods, Rope, etc., required.

The Machinery, Tools, etc., mentioned are capable of drilling a well to almost any depth.

The quantity of Drive Pipe and Casing can only be estimated. In some places no Drive Pipe is used, a hole being dug down to the rock and a wooden "conductor," figure 260, used in the place of the pipe ; but when the rock is more than 20 feet below the surface it is generally necessary to put in Drive Pipe.

The quantity of Casing required depends upon how far down the veins of surface water extend. It is but seldom that more than three hundred (300) feet is necessary.

TORPEDOES.

After a well is sunk to the proper depth it is torpedoed. A torpedo is a charge of nitro-glycerine in a suitable shell, which is lowered to the oil-bearing rock and there exploded, with the effect of enlarging the bore of the well at that point, and opening fissures into the surrounding rock. It is now the nearly universal practice to torpedo wells before tubing them. After the wells diminish in production they are sometimes restored by torpedoes.

There are two kinds of shells. One, figure 83, which is supported on an anchor at the proper height above the bottom of the well. It is lowered into the well by a cord, which has a hook that can readily be detached from the bail. The shell is provided with a flat disk, which nearly fills the hole,

and from its bottom projects a firing rod, on the end of which is mounted a percussion cap. An anvil, for the cap to be forced against, is fixed in the shell. The cord is withdrawn, and a weight is dropped from the top of the well, which, falling upon the disk, explodes the cap and fires the torpedo. Several hundred feet of fluid are allowed to accumulate, or are poured into the well above the point of explosion to tamp the shot, though some contend that no tamping is needed when nitro-glycerine is used. As in many localities nitro-glycerine cannot be obtained, gun powder must be used. A water-proof shell should then be employed.

The other kind of shell, figure 79, is suspended by a cord, on which runs a hollow weight, and the cord guides it to the firing head, which is constructed so as to communicate a blow to the percussion cap, and explode it. The detonation will explode the nitro-glycerine.

We can furnish the firing heads and the drop weights, or the shells complete, but the shell and the anchors can be made by any tinsmith.

The sizes of shells vary from a few quarts of nitro-glycerine to upwards of one hundred quarts. No indication of the explosion is given at the surface except a sharp crack like that of a pistol, and an almost imperceptible quiver of the ground.

A few moments after the explosion the superincumbent fluid is shot into the air with great violence, forming a magnificent fountain, which spouts many feet above the derrick. This is followed by a discharge of gravel and small stones. The torpedo shell and exploding weight are blown into such small fragments that they form no obstruction to after operations.

The first flow comes with such force that it is useless to try to save the oil, and it is therefore wasted. A few minutes after the force of the explosion is over, the well flows a second and sometimes a third time. There is generally sufficient time to make the connections, from the casing head to the tank, between the first and second flows, if everything is in readiness. After the flows occasioned by the torpedo and its reaction are over, the well is tubed.

Large torpedoes are lowered in sections of twenty quarts, each section being three and a half inches in diameter and ten feet long, and the sections are so arranged that the bottom of one fits into the top of another, and the upper one is provided with the firing head. As each section with the line weighs nearly eighty pounds, the reel must be of sufficient strength to support it, and be provided with a reliable brake. McClure's Reel, figure 441, made under a patent of which we have the exclusive control, is the best form, and has displaced all other kinds.

CORBETT SECTIONAL BULL WHEELS AND BAND WHEELS.

These wheels, figures 31, 33, 35 and 36, are so superior to the common kinds that they merit separate description. They are readily slipped from the shaft, and are made in sections which are easily taken apart or put together. They are, therefore, peculiarly adapted for transportation by cars, vessels or carts.

The rims are supported by cross stiles, and in each wheel two pairs are employed, each pair at right angles to the other, and extending across the sides of the shaft from one part of the rim to an opposite part, and presenting their edges to the line of motion, therefore meeting with far less atmospheric resistance than the ordinary kinds, in which the arms are flat.

This is very important, as it often saves the wheel from being torn to pieces.

On the bull wheel shaft are firmly fastened short arms, to which the wheels are secured by bolts, and blocks are so secured on the wheel as to equally distribute the strain of rotation.

On the shaft attached to the short arms are collars which support the arms, and distribute the thrust equally between them and keep the cable from engaging with the wheels. These collars form convenient wheels on which to roll the heavy shaft short distances, or over obstructions.

The wheels are lighter and far stronger than the common ones, and but little more expensive.

We furnish cants, arms and shafts of the common variety, but we recommend the Corbett wheels in all cases where transportation charges are of any great importance, and especially where skilled labor cannot be had, as these wheels can be put together by any one.

DEPTH OF WELLS.

In this catalogue, wells over 1,000 feet are called deep wells, those between 600 and 1,000 feet are called medium wells, and less than 600 feet are called shallow wells.

CORBETT'S PATENT STRAIGHT LINE RIG AND SAND REEL.

(See Figures 4 and 36.)

This style of rig is covered by Letters Patent, and has many points of superiority over the common kind. We have it fully illustrated in a special circular with large drawing, and will mail the same on application. It seems destined to be used, to the exclusion of the common form, because it saves timber and labor, in every case, and when a rig has to be put up on a steep hill-side, it will save grading, because the timbers are shorter than in the old style.

The timbers are placed at right angles to each other, and the sub or counter sills are parallel to the main sill. The main sill is not weakened by cutting for the front jack post, and the jack post cannot be lifted from its seat nor the main sill split. The front brace of the samson post is dispensed with, and the back brace is bolted at the upper end ; the lower end is let into the mud sill and held by two keys, and if the timbers settle out of line, the samson post and walking beam can be quickly lined by loosening one key and tightening the other. The sand line is wound on a space 20 inches in length, which gives the coil a large diameter and the sand pump is drawn very rapidly, although the reel revolves less frequently than the common one. This reel is shown separately at figure 41, and can be applied to any style of rig. It takes the line in such a way that the weight of the line draws the reel straight against the face of the band wheel, causing it to run smoothly, thus avoiding injurious end motion (which rapidly injures both band wheel and reel), and relieving the driller of the greater part of the labor of holding the reel. In a practical test, with the engine running at regular speed, the sand pump has been drawn from the bottom of a 2,000-foot well in less than one minute.

CORBETT'S NEW PROCESS APPARATUS.

(Figures 5, 6 and 7.)

This style of rig does away with the walking beam, and sets up a samson post in the derrick in the place occupied by the dead head post of the common rig. This samson post is constructed of two upright posts, well braced and secured to the main sill.

On the top of these posts are fastened arms, on which the journals of the drilling wheel rest. The band wheel is placed almost wholly in the derrick, and occupies a space that is not utilized in the ordinary construction. The entire rig is shortened, covering an area of fifty feet in length by twenty-one feet in width only, thus making a large saving of space, lumber, timbers, rig irons and labor. In place of the walking beam is a drilling wheel, and in the place of the pitman a short piece of cable, to which the temper screw is attached, as shown in figure 5.

A walking beam, describing the arc of a circle, gives to the temper screw an oscillating motion which is conveyed to the cable, causing it to rub against the side of the well and wear out rapidly, but by the use of this drilling wheel the tools are raised and dropped in a perpendicular line, avoiding unnecessary wear of the cable, and a much harder blow is struck as the tools fall more rapidly.

The ground plan is shown in figure 6.

In the pumping apparatus as shown in figure 7 a slight addition is made, as a pitman is substituted for the short piece of cable, and short arms, which are connected to said pitman, are secured to the sides of the wheel.

Around the wheel is fastened a wire rope, the ends of which are secured to adjusters through which the polished rod passes, the length of stroke being regulated at the crank. When in use the downward movement of the crank winds up the end of the rope attached to the lower adjuster at the same time the end that is fastened to the upper adjuster is unwound, thereby raising the sucker rods ; on the upward movement of the crank the action of the rope is reversed, forcing the rods downward.

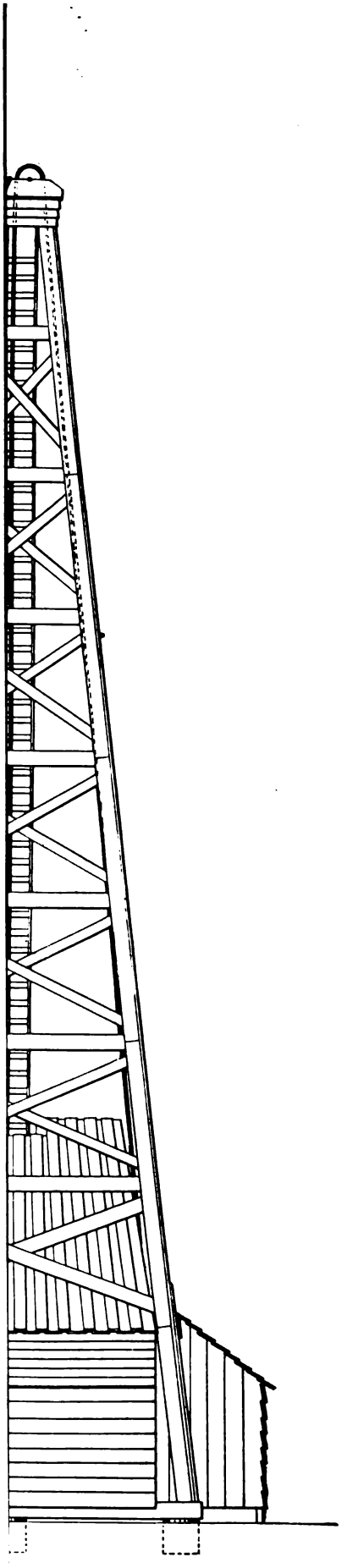
The motion of the polished rod is therefore vertical, the oscillating movement that occurs when it is attached to a walking beam being avoided.

BOLTED DERRICK.

(Figures 9 and 10.)

This derrick is made of pine or hard wood. Every piece is fitted and numbered and marked before being sent out. It can be readily put together by the most inexperienced in any part of the world.

Bolts and metal corner pieces are furnished with the rig. This rig can be put up and taken down repeatedly and ought to drill a great many wells. Its construction is such that it is stronger than any nailed rig. The details of the construction and bracing are well shown in figure 10.

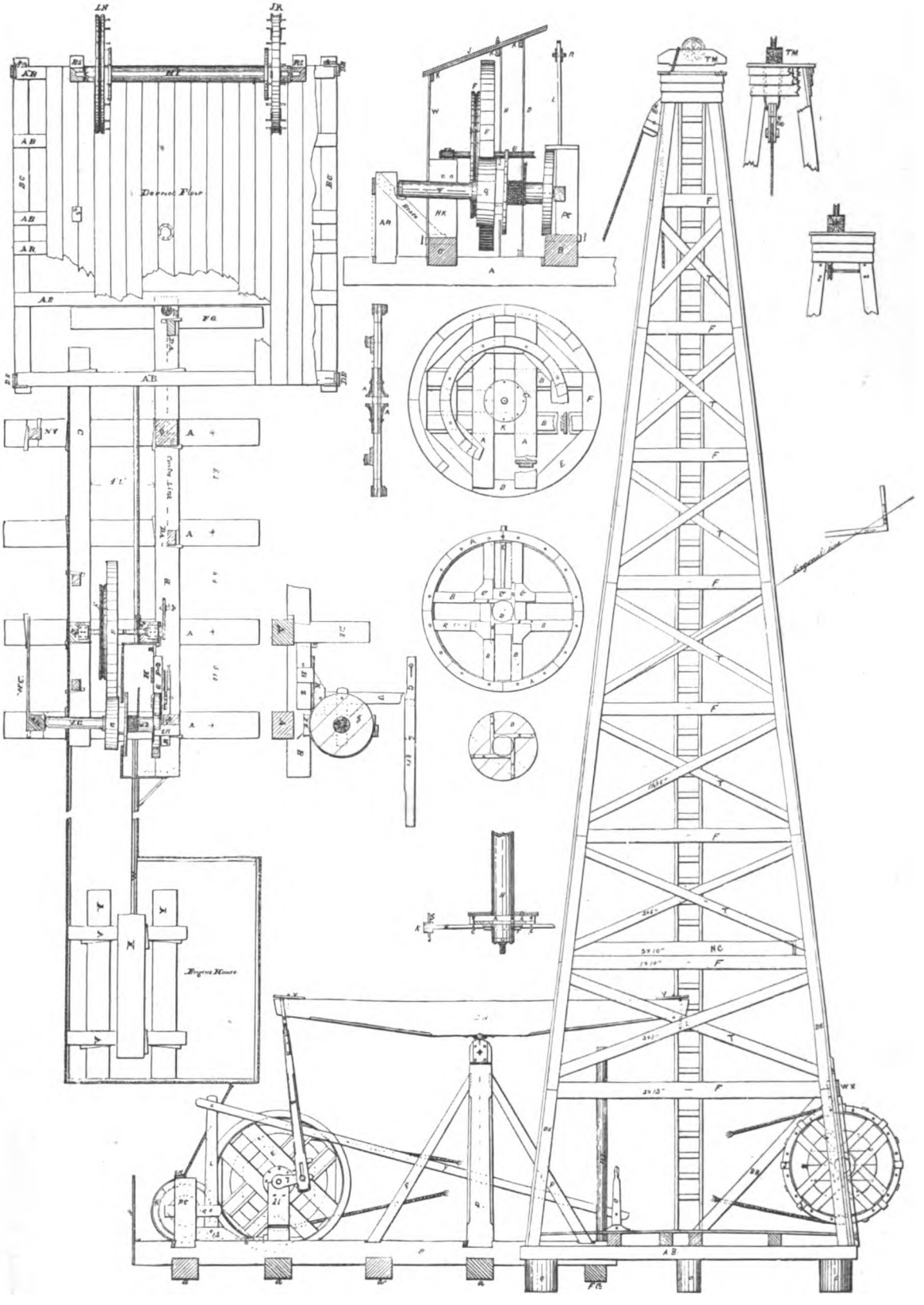


ICK.

CORBETT'S PATENT STRAIGHT LINE RIG.

FIGURE 4.

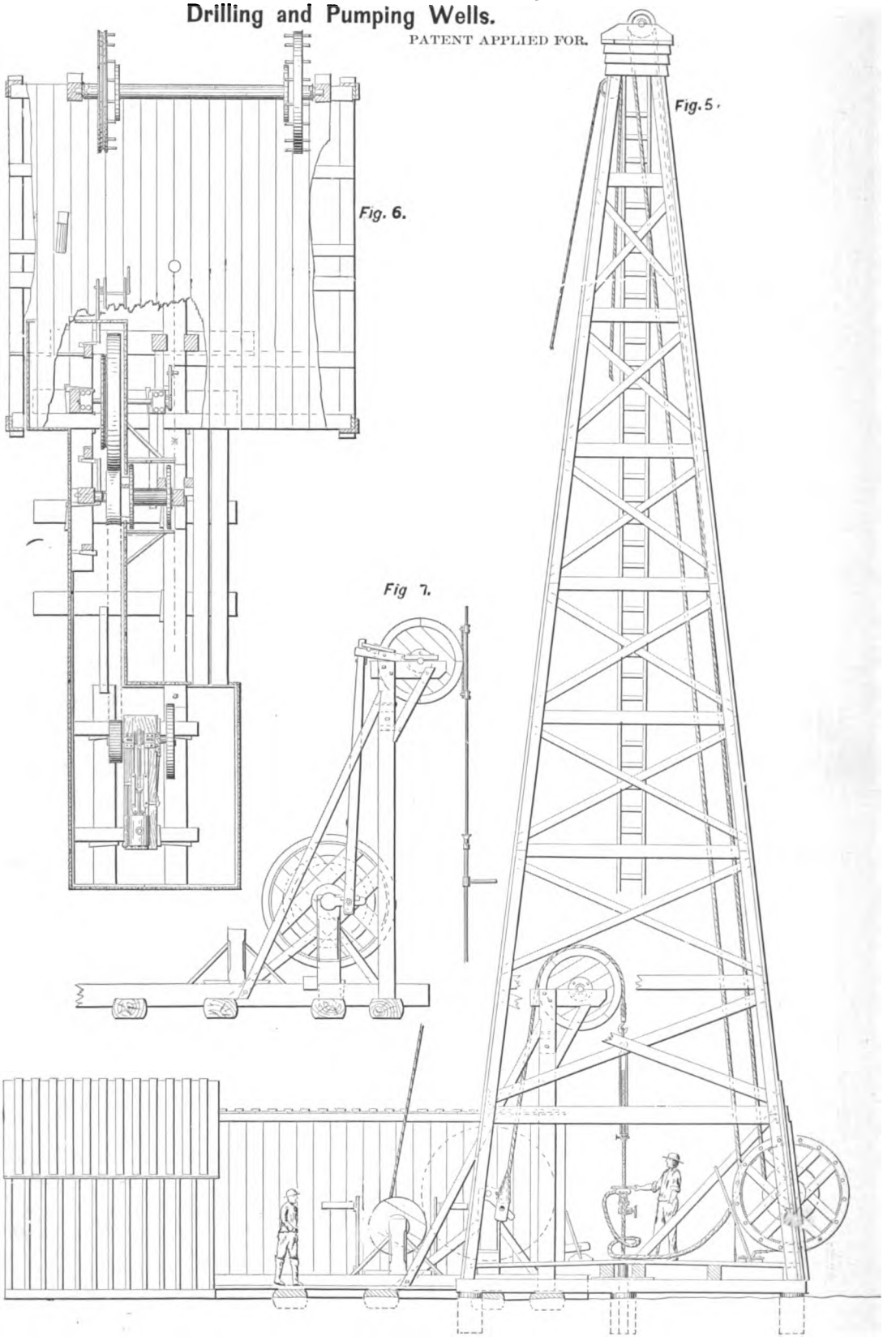
PATENTED JUNE 10, 1879.



The above is a reduced copy of a large plan which, with full description, will be furnished to any applicant. Its advantages over the common rig are summarized on page 22.

Corbett's New Process Apparatus or Rig for Drilling and Pumping Wells.

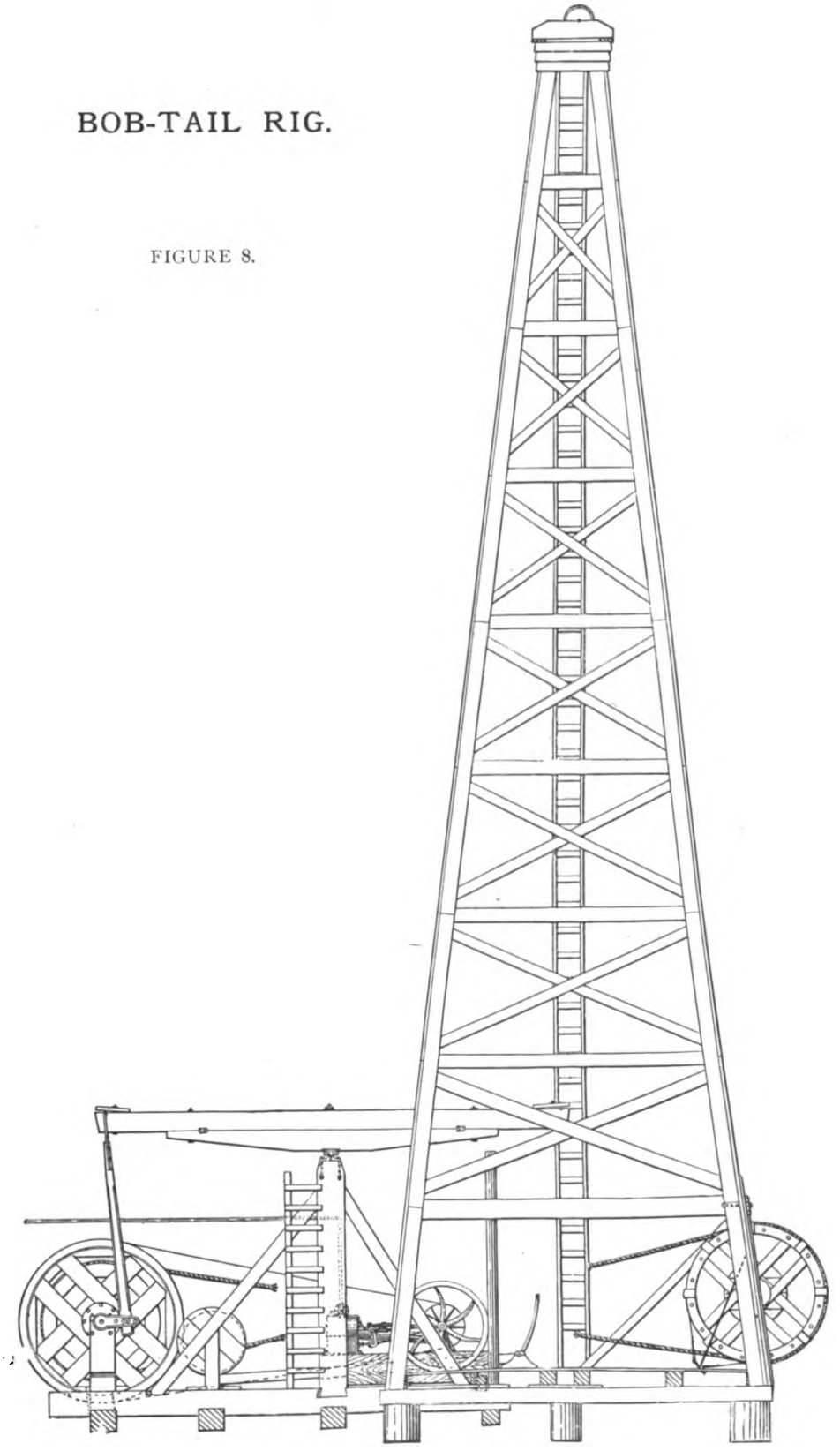
PATENT APPLIED FOR.



For description see page 22.

BOB-TAIL RIG.

FIGURE 8.

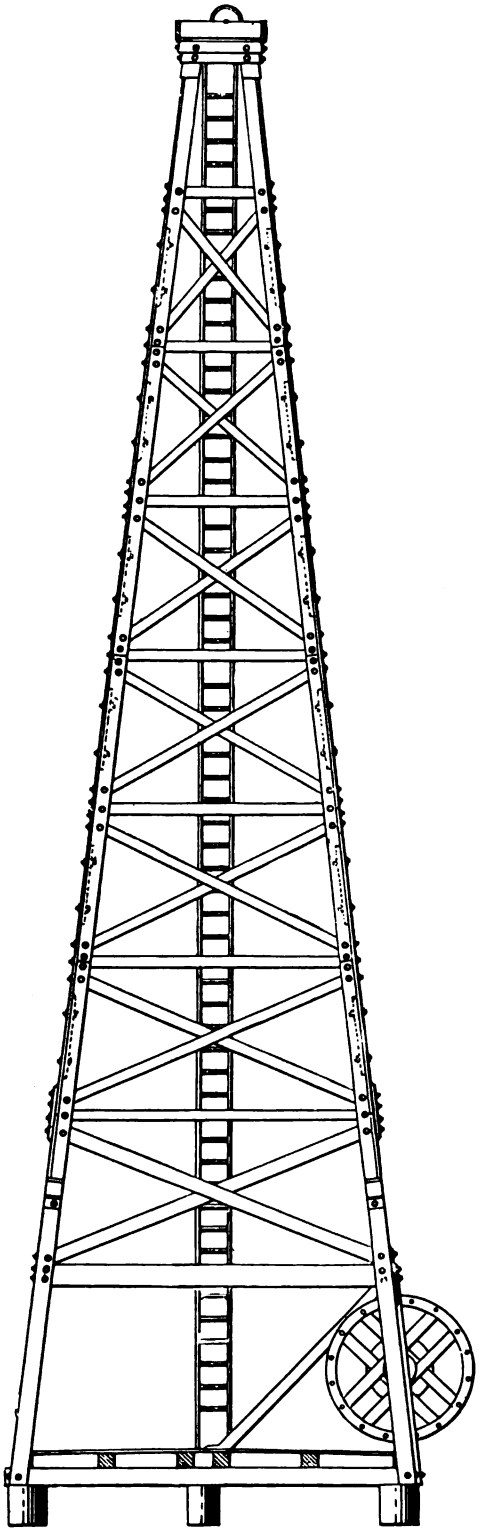


The engine is in the derrick. Used where ground is limited. Can be put in a space 43 x 21 feet.

BOLTED DERRICK.

FIGURE 9.

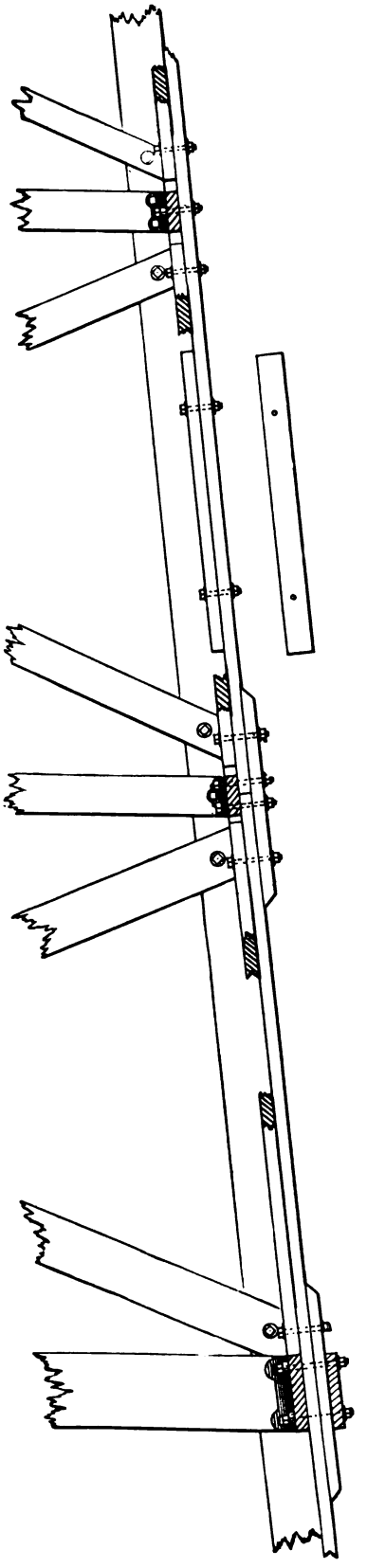
(See page 22).



Corner of Bolted Derrick.

[ENLARGED.]

FIGURE 10.

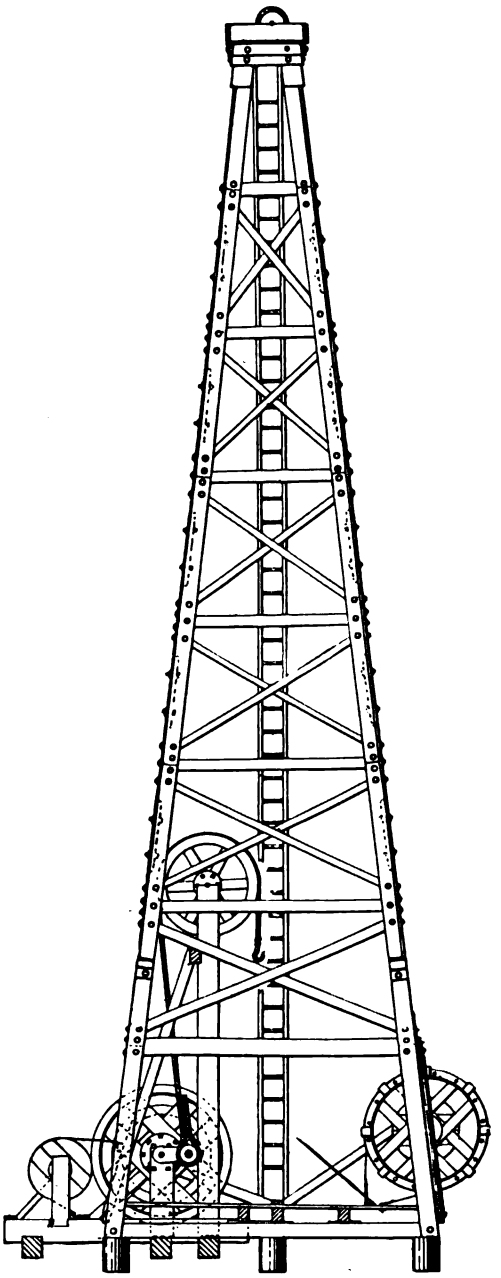


BOLTED DERRICK.

58 FEET HIGH; FOR MEDIUM WELLS.

With Corbett's New Process of Drilling.

FIGURE 11.

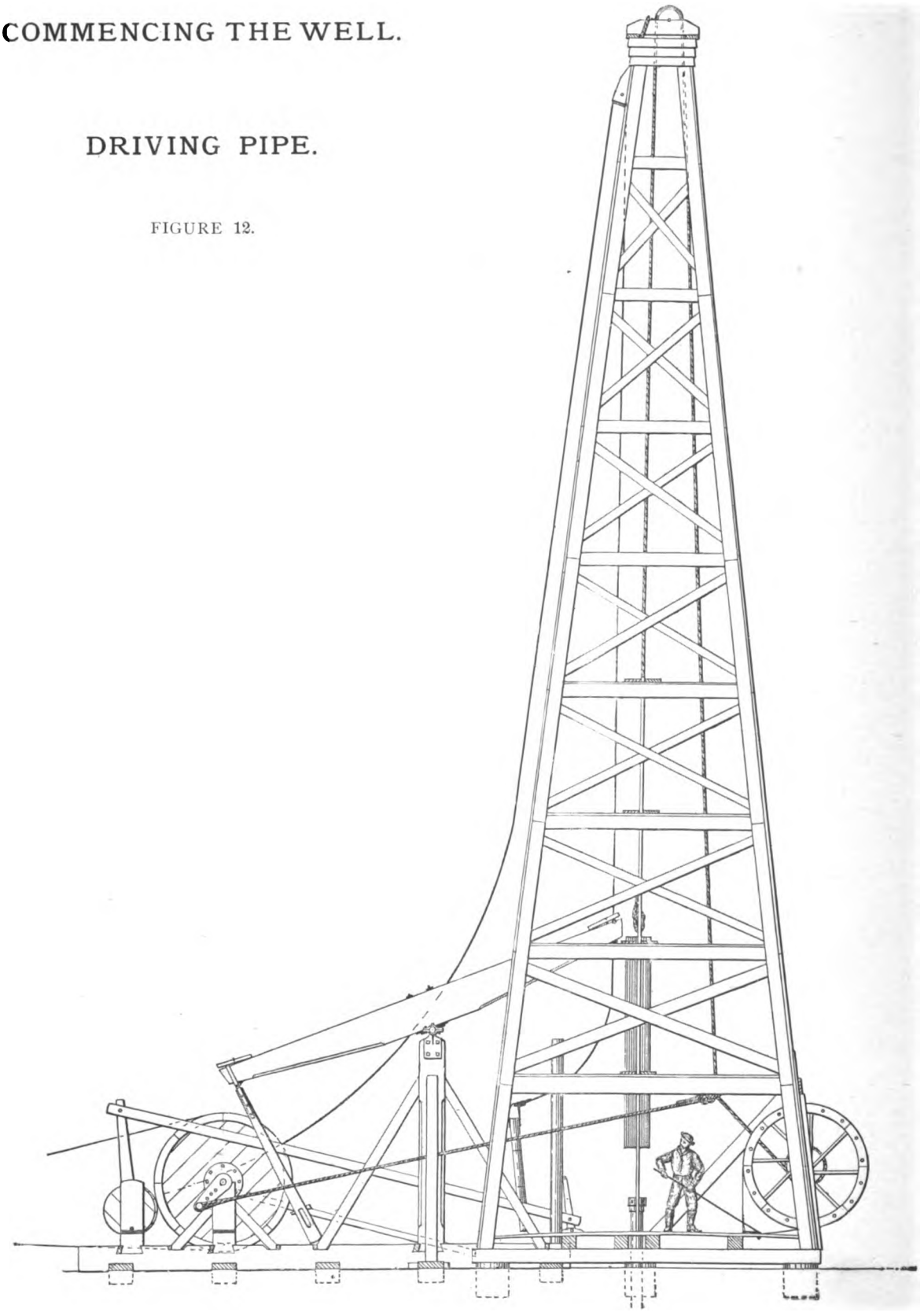


This is the same style of derrick as that illustrated in figure 9, and differs only in height. The new process of drilling, figures 5, 6 and 7, and page 22, can be used in this derrick. This style and height are particularly adapted for wells less than 1,000 feet deep.

COMMENCING THE WELL.

DRIVING PIPE.

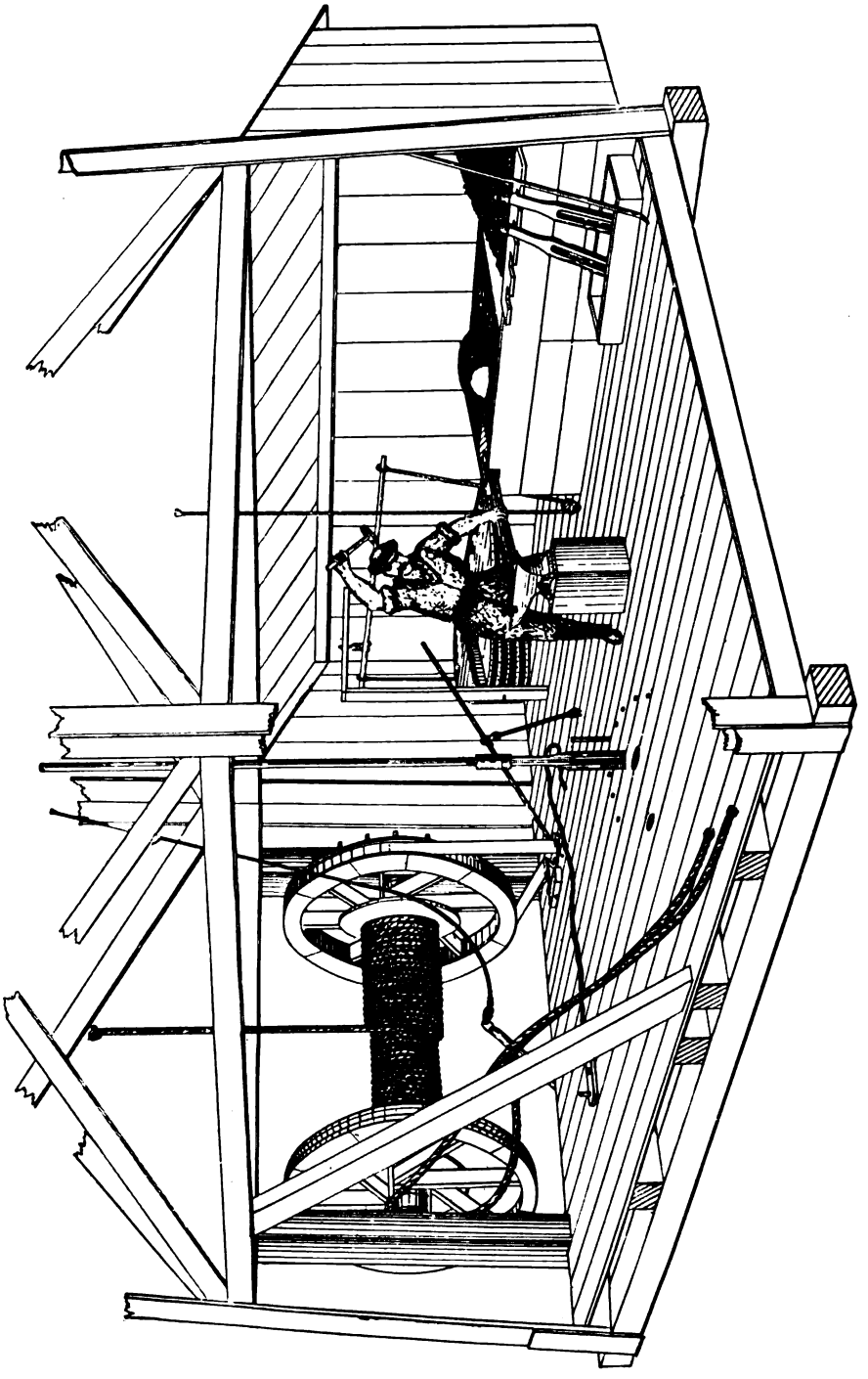
FIGURE 12.



This method of driving pipe is described on page 14, and substantially the same method is used in "spudding," also mentioned on page 14.

DRESSING TOOLS.

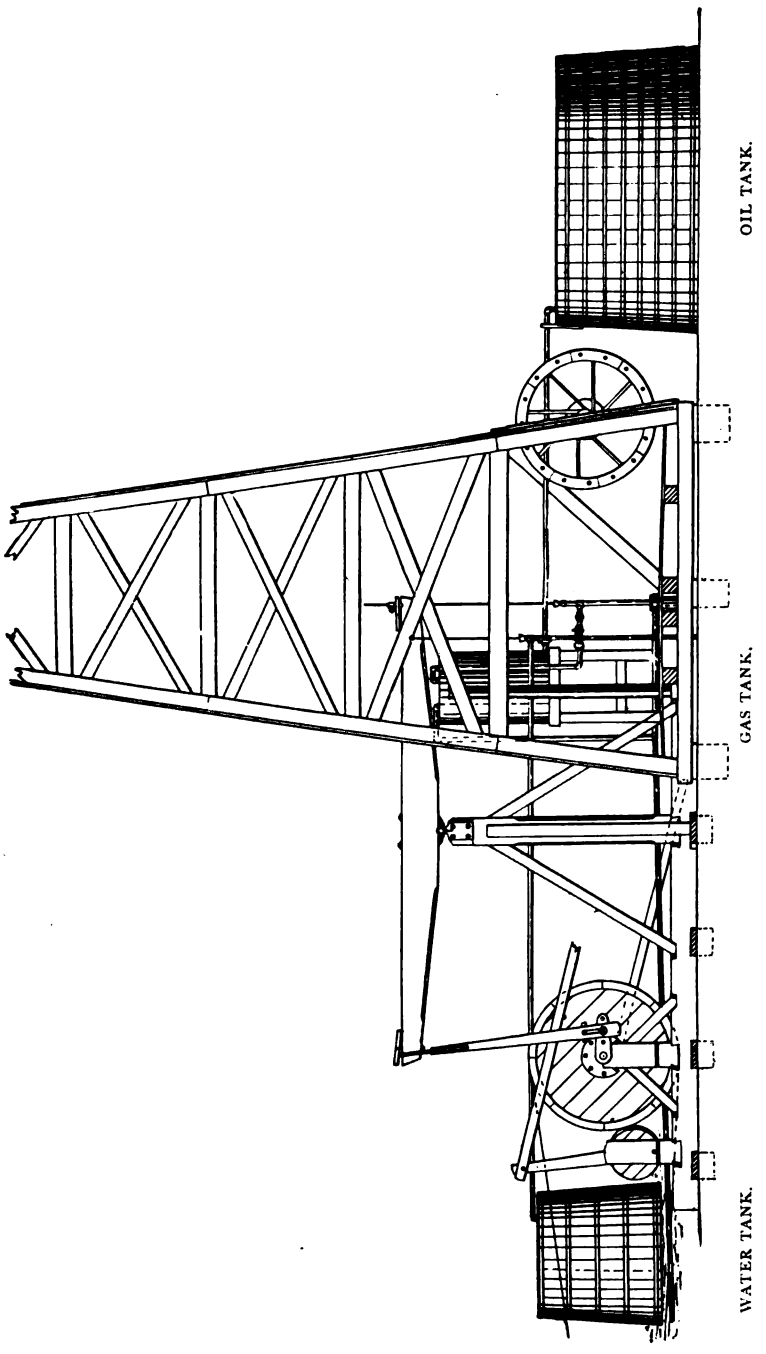
FIGURE 13



Showing Blacksmith's Forge, inside of Derrick, with perspective view of anvil, bellows, bull wheels, brake, and cast off with cord. The broken rope in the foreground is the bull rope. The sand pump is under the bull wheel. See page 16.

PUMPING WELL.

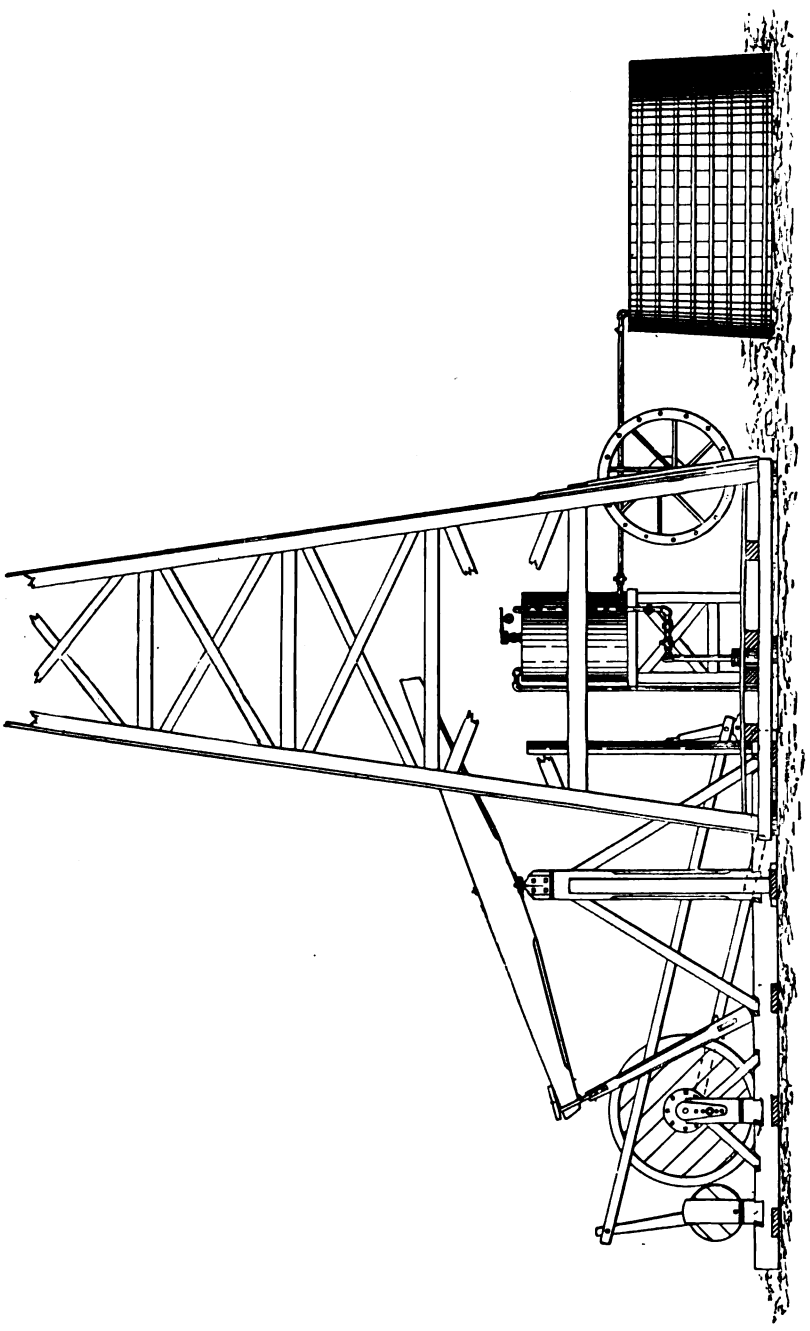
FIGURE 14.



Both oil and water are pumped, the water well being a few feet from the oil well, between it and the samson post. Both wells have attachments to the walking beam and are pumped by the same stroke. The oil is pumped into the gas tank (see figure 410) and there separates by gravity from the gas, and is then conducted to the oil tank. The gas is led from the upper part of the gas tank to the furnace and is burned under the boiler.

FLOWING WELL.

FIGURE 15.

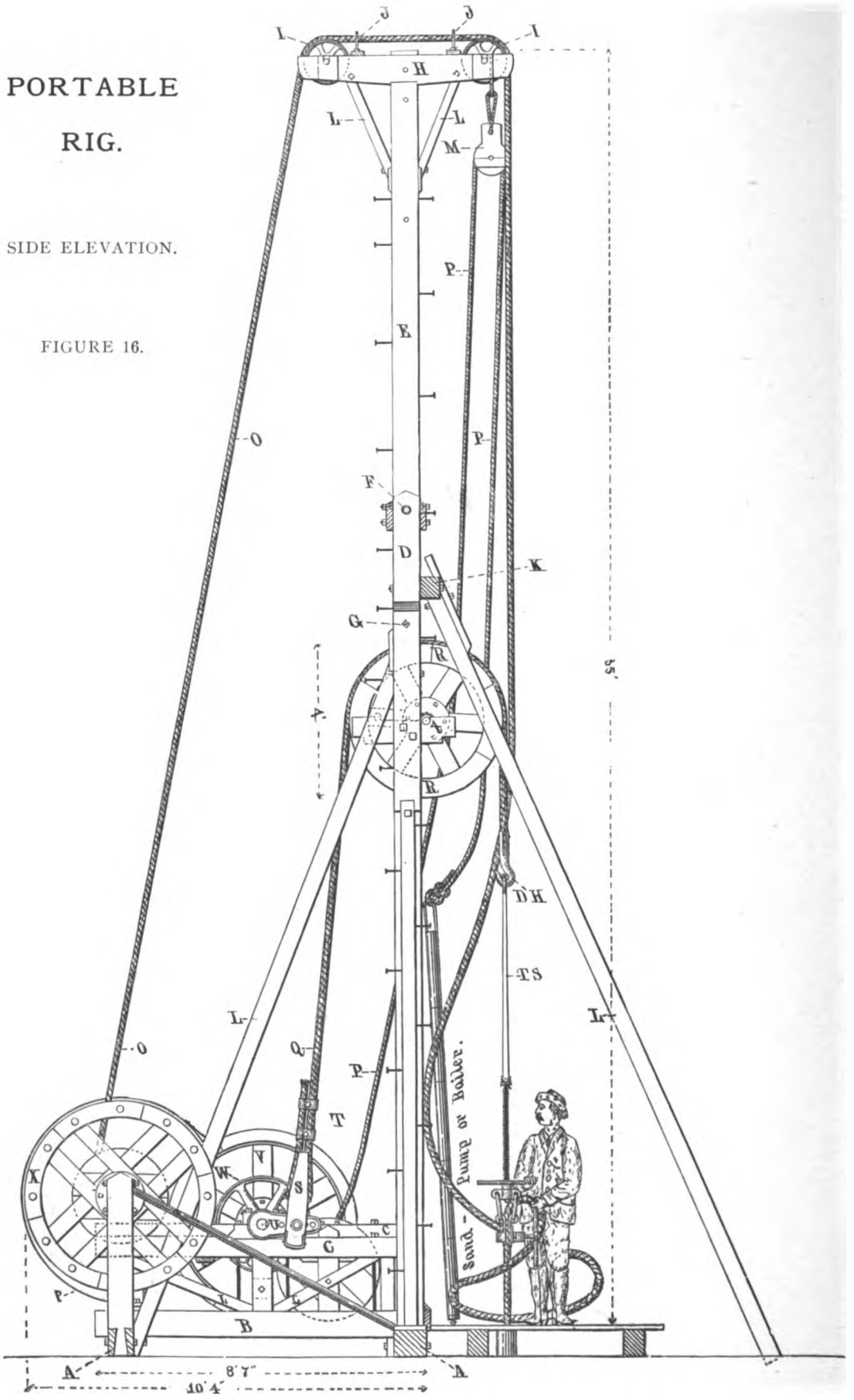


The oil flows into the gas tank (shown near centre of derrick) and is there separated from the gas, and flows into the large tank shown on the right. The gas may be used for fuel or light. The gas tank is essential to separate the gas and oil; the best form is the Ashton, shown in figure 410.

PORTABLE RIG.

SIDE ELEVATION.

FIGURE 16.



See also figures 17, 18, 19, 20 and 21. For description see page 36.

PORTABLE RIG.

FRONT ELEVATION.

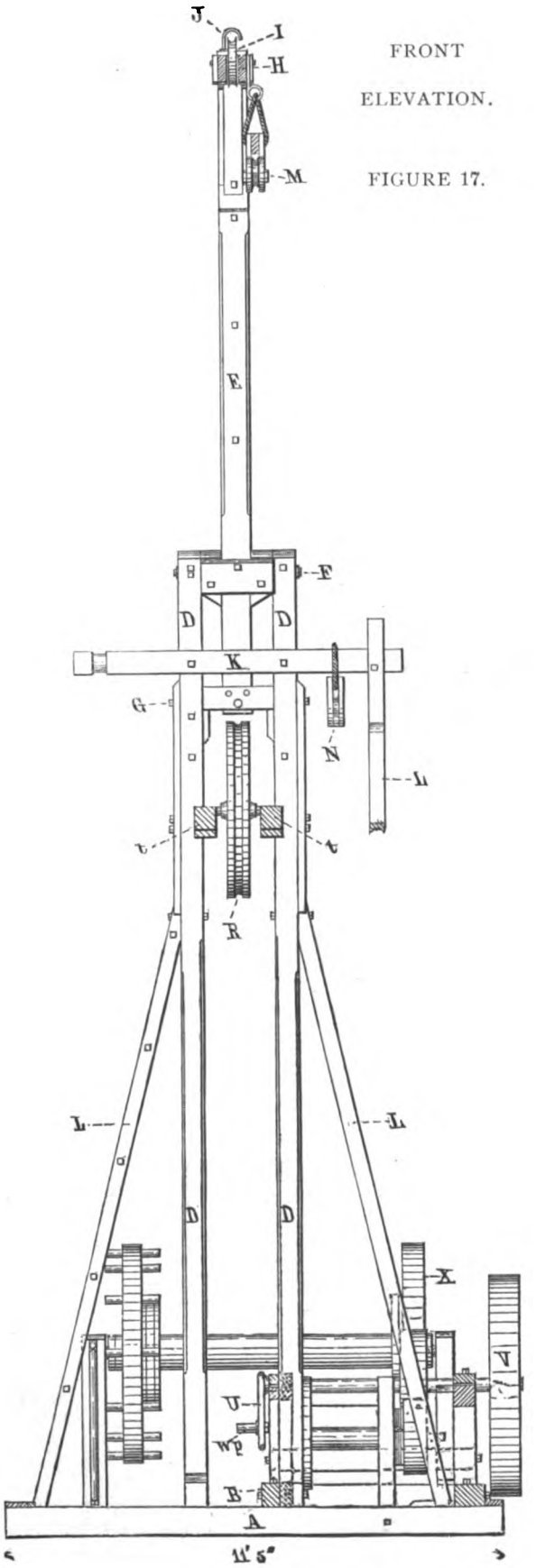


FIGURE 17.

GROUND PLAN.

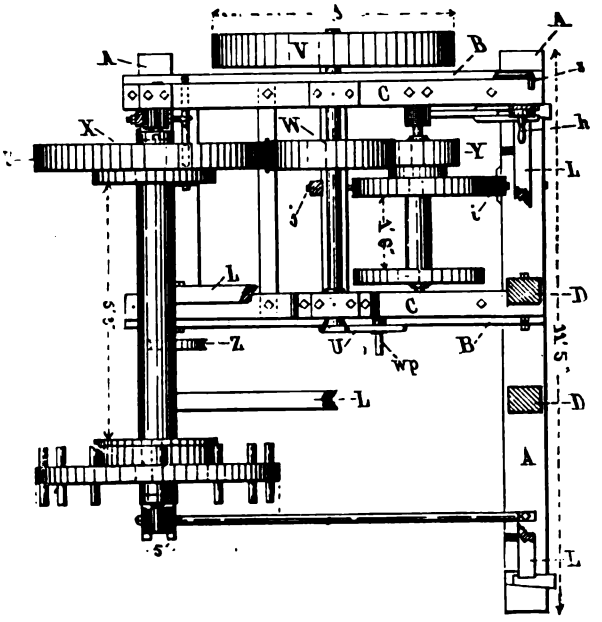


FIGURE 18.

PLAN OF FRICTION WHEELS AND BRAKE LEVERS.

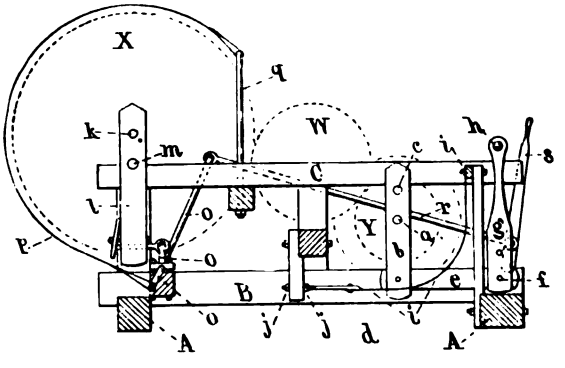
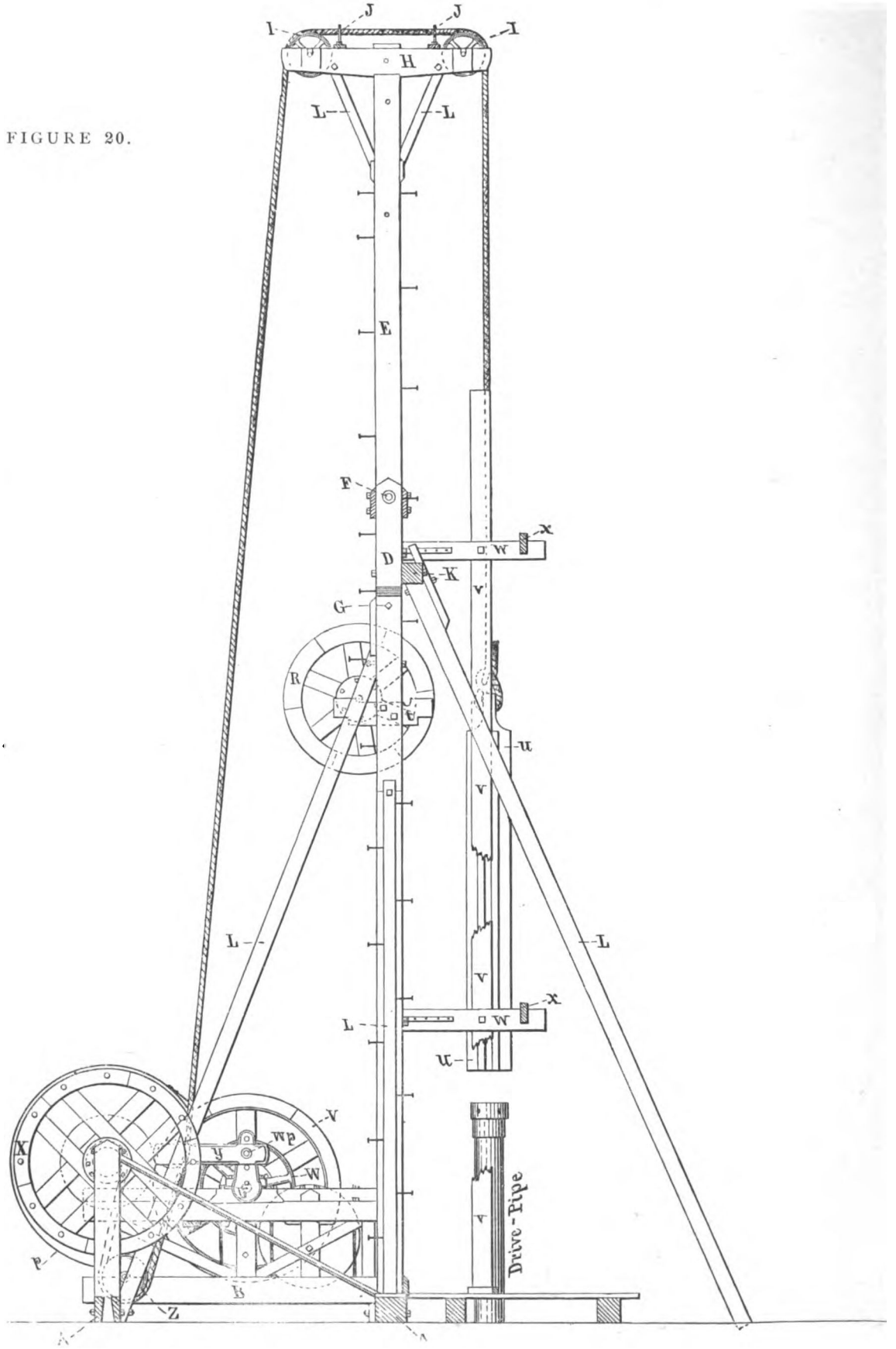


FIGURE 19.

Highly recommended for wells less than 600 feet deep. Can be used with either steam or horse-power. See also figures 16, 20 and 21. See description, page 36.

PORTABLE RIG. DRIVING PIPE.

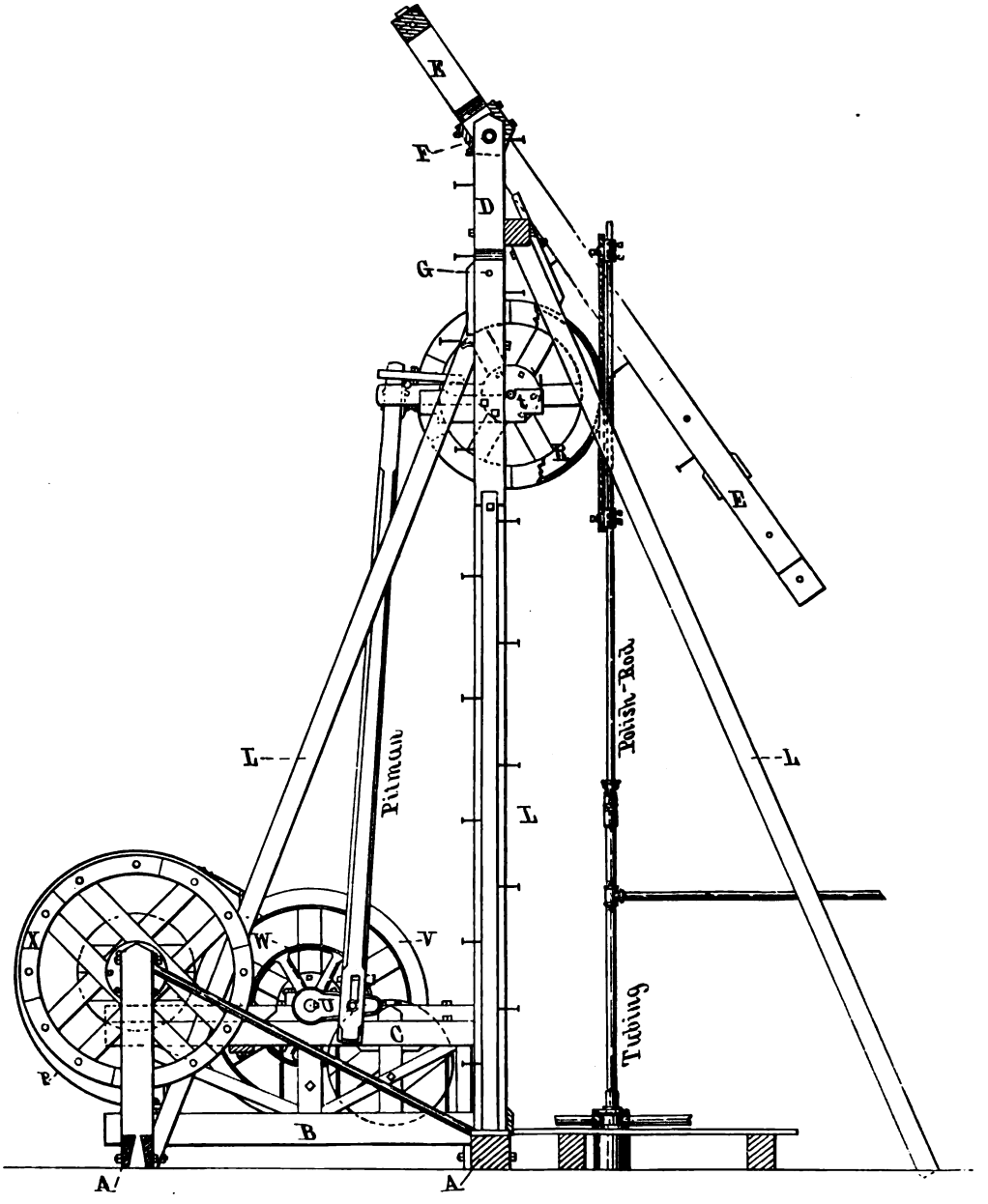
FIGURE 20.



See also figures 16, 17, 18, 19 and 21, and description at page 36.

PORTABLE RIG ARRANGED FOR PUMPING.

FIGURE 21.



See also figures 16, 17, 18, 19 and 20, and description at page 36.

PORTABLE RIG.

(FIGURES 16, 17, 18, 19, 20 AND 21.)

This rig is readily put up, or taken down, and is adapted to be transported from place to place.

It will swing a set of drilling tools 31 feet long, weighing 950 pounds. It has been thoroughly tested, and is in all respects superior to any other ever devised for the purpose.

It occupies a space of but 12 x 20 feet, and is capable of drilling over 600 feet. It weighs, complete, only two tons, and, when the mast is folded, is 25 feet high. It can be operated by a small engine, figure 110, or by horse-power, figures 111 to 114.

Two mud sills, *A A*, one 10 inches square and 11 feet 5 inches long, and the other 8 x 10 inches, and 10 feet long rest upon the ground, and sustain two beams, *B B*, 6 x 8 inches and 8 feet 7 inches long, which support on proper posts the frame work, *C*. The double samson post, *D D*, is fastened to the principal mud sill, *A*, and the mast, *E*, is hinged therein at *F* by a piece of tubing passed through both posts and mast. A bolt with large washers is put through the pipe, and a nut and large washer put on. At the point, *G*, another bolt is put through both samson posts and mast after the mast is raised to its place.

On the top of the mast is the pulley frame, *H*, which carries the crown pulleys, *I I*, and the guide hooks, *J J*, which keep the drilling cable, *O*, in place. At *K* is a cross-bar which ties the tops of the samson posts, *D D*, together. *L L* are braces put where needed. All the parts are secured by bolts and nuts, no nails being used.

The sand pump block, *M*, is hung on the crown beam, *H*, and on the cross-bar, *K*, is hung a guide pulley, *N*, for the sand pump line, *P*.

The working line, *Q*, passes over the drilling-wheel, *R*, and is firmly fastened to the pitman block, *S*, by being doubled through an aperture therein, and the two ends of the rope are firmly fastened together by the clamps, *T T*, (see figures 421 and 422). The other end of the working cable is terminated by a drilling hook, *D H*, on which the temper screw, *T S* (see figure 116), is hung.

The Pitman block, *S*, fits in the wrist pin *w p* (see figure 18), of the crank, *U*, and rotation of the crank causes a reciprocating vertical motion of the tools.

V is the band wheel to which power is communicated from the engine or horse-power machine. On the shaft of *V* is keyed the friction wheel, *W*. Either the bull wheel, *X*, or sand reel pulley, *Y*, is brought against the friction wheel, *W*, as required.

The sand reel is hung at *a*, on the swinging beam, *b*, which is pivoted at *c* to the frame, *C*. At *d* there is united to the swinging beam, *b*, the draw bar, *e*, which is united at *f* to the lever, *g*. A pull upon the lever handle, *h*, will throw the pulley, *Y*, of the sand reel against the friction pulley, and this will cause it to rotate, and wind up the sand line, *P*, while a push upon the lever will cause the wheel of the sand reel to press against the brake, *i*, which is a band of iron fitted to encircle a fourth of that wheel. Provision is made for tightening that band by the nuts at *j j*, so as to take up any slack.

One end of the bull wheel, *X*, is pivoted at *k*, on the swinging-bar, *l*, which is pivoted at *m* to the frame *C*. A T bolt unites the swing-bar, *l*, to the iron lever, *o*. This lever has one long arm and two equal short arms and two bearings, the two short arms being nearly opposite each other, one projecting above the beam, *B*, and the other extending an equal distance below its surface. The swinging-bar, *l*, is united to one short arm, and the brake band, *p*, is united to the other short arm. A draw bar, *r*, connects the long arm of the lever, *o*, with the hand lever. The brake band, *p*, encircles nearly three-fourths of the bull wheel, and is firmly fastened to the rod, *q*, which is bolted to the frame, *C*. A pull upon the hand lever loosens the brake band, *p*, and forces the bull wheel, *X*, against the friction wheel, *W*. A push upon the handle, *s*, forces the bull wheel away from the friction wheel, *W*, and clasps the brake band, *p*, firmly around the wheel.

The action of the hand levers, *h* and *s*, in controlling the motions of the sand reel and bull wheel respectively, is quick and effective. The bearing surfaces are wide, and the wheels truly made, so that motion is immediately communicated without the least slip, and the brakes can be applied so as to stop the wheels instantly while in their swiftest motion. When the levers stand straight both bull wheels and sand pump reel revolve freely.

The drilling wheel, *R*, rests in grooves in the supports, *t*. There are two sets of these grooves, one in front of, and the other behind the samson posts, *D*. When the drilling wheel, *R*, is in use it rests in the front grooves, as shown in figures 16 and 21, but when not in use, it is put in the back grooves, as shown in figure 20.

When it is necessary to "drive pipe" or "spud" (see page 14) a small grooved wheel, *Z*, is fixed in the centre line of the samson posts, below the bull wheel.

The cable, *O*, is carried downward around the grooved wheel, *Z*, and upward over the crown pulleys, *I I*, and united to the maul, *u*, which plays in the guides, *v*, which are supported by bars, *w*, hinged to the samson posts, *D*, the front ends of which hinged bars, *w*, are kept in position by cross-ties, *x*,

A short bar, *y*, with a grooved wheel at one end, inside of which plays the cable, *O*, is fastened to the wrist pin, *w p*, so as to allow such wrist pin to turn freely. Rotation of the crank causes an alternate tension and loosening of the cable, *O*, and thus the maul, *u*, is elevated and allowed to drop similar to the operation shown in figure 12, and described on page 14.

When the well is pumped the polished rod has clamped upon it, at two points, a wire rope which encircles the working wheel, *R*, and a projecting arm is fastened to that wheel, and connected to a pitman which is attached to the wrist pin. This is shown in figure 21. The mast may be left erect, or, as shown in that figure, folded down.

This pumping motion is remarkably even and steady, as the polished rod moves in a perpendicular line and saves the tubing from any jar or vibration.

Strong bolts are inserted in each side of one of the side braces on one of the samson posts, *D*, and on the mast, *E*, to form a ladder for easy access to the top.

This rig can be readily taken apart, or put together, and any carpenter can substitute any wooden part that may become injured. With fair usage this rig ought to drill hundreds of wells.

A platform can be provided in front of the derrick for the convenience of workmen.

Nothing finer than this, for drilling wells by a portable rig, has ever been devised.

ESTIMATE OF MATERIAL FOR DRILLING A WELL 600 FEET DEEP.

WITH PORTABLE RIG, FIGURES 16, 17, 18, 19, and 20.

One Portable Rig, 35 feet high, complete. (See figures 16, 17, 18, 19.)
One Boiler and Drilling Engine on Wheels, figure 110, or Horse-power (figures 111 to 114).
50 feet, 7-inch Four-Ply Rubber Belting from Engine to Rig.
One Drilling Cable, figure 76, 1½-inch x 600 feet, say 500 lbs.
One Sand Line ⅝-inch x 600 feet, say 85 lbs., figure 76,
One Soft Laid Line, *Q*, 1¾-inch x 20 feet, say 20 lbs.

DRILLING TOOLS.

One 3-inch Auger Stem, 15 feet long, figure 118.
One 3-inch Sinker Bar, six feet long, figure 117.
One Pair Jars, figure 119.
Two Large Bits, 8-inch hole, figure 121.
Two Small bits, 5½-inch hole, figure 120.
One Rope Socket, figure 115.
One Temper Screw, figure 116.
Two Tool Wrenches, figure 122.
Two Tool Gauges, figure 123.
One 5-inch Sand Pump, figure 225.
One Wrought Iron Bailer, 16 feet long, figure 230.
One Portable Forge, No. 1, figure 868.
One Anvil, 125 lbs., figure 240.
Two Sledges and Handles, 10 lbs. and 16 lbs., Figure 243.
One Ball Peen Hammer, No. 70 with handle, figure 242.
Two Pairs Blacksmith Tongs, figure 241.
Two No. 2 Telegraph Wheels, figure 249.
One Telegraph Cord and one Reverse Cord.
Two Derrick Lamps, figure 244.
Five lbs. Lampwick.

The Cable and other lines, Drilling Tools, Sand Pump Boiler and smaller fixtures can be used for several wells, until worn out.

A set of Drilling Tools, such as named in estimate, consisting of Rope Socket, Sinker Bar, Jars, Auger Stem, and Bit, would weigh from 900 to 950 pounds.

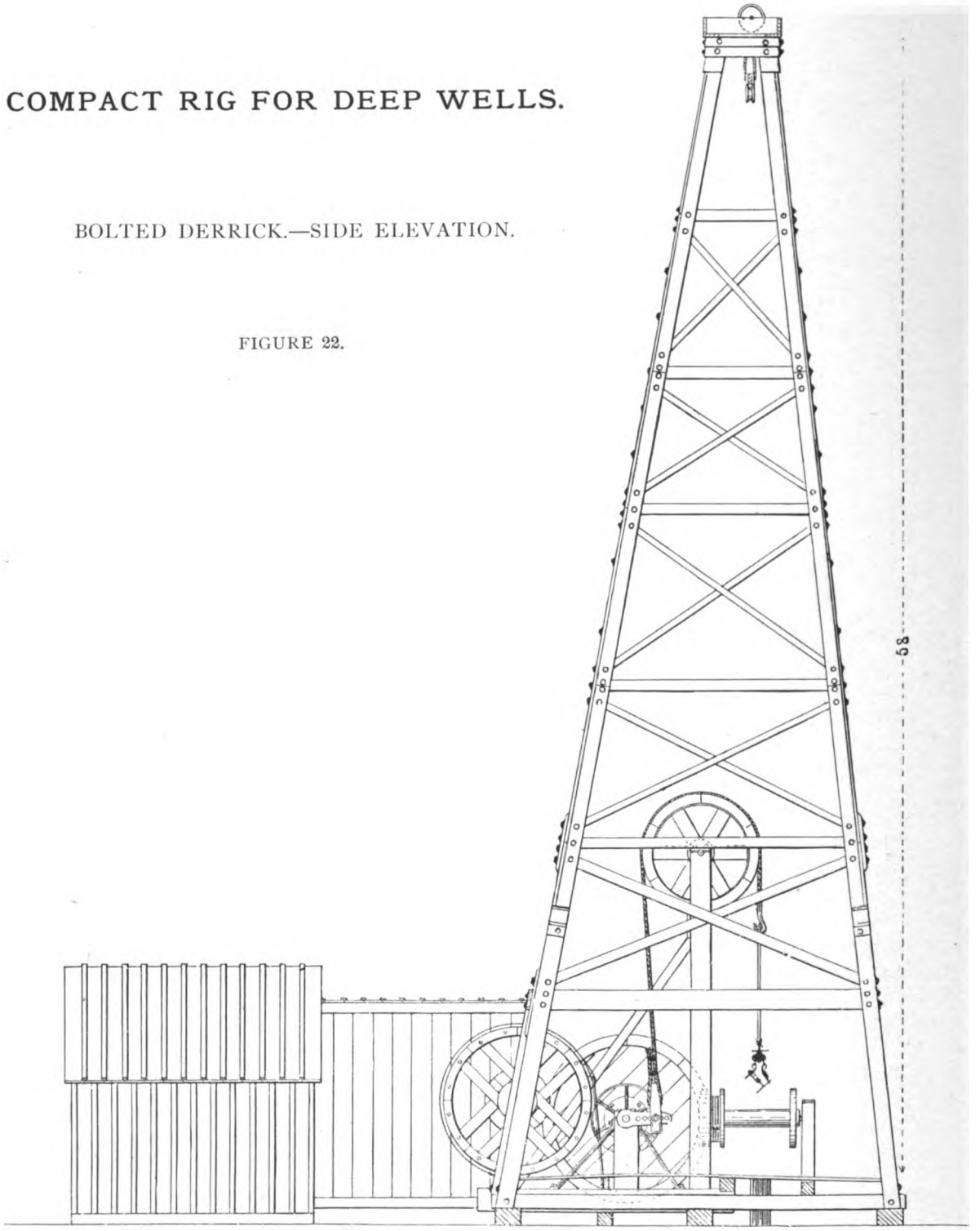
The estimate is for a well 600 feet deep, which is the maximum depth for which we would recommend this kind of outfit. For shallower wells the ropes would cost proportionately less.

This rig is particularly recommended to parties prospecting for coal or other minerals, when the veins lie within a few hundred feet of the surface.

COMPACT RIG FOR DEEP WELLS.

BOLTED DERRICK.—SIDE ELEVATION.

FIGURE 22.

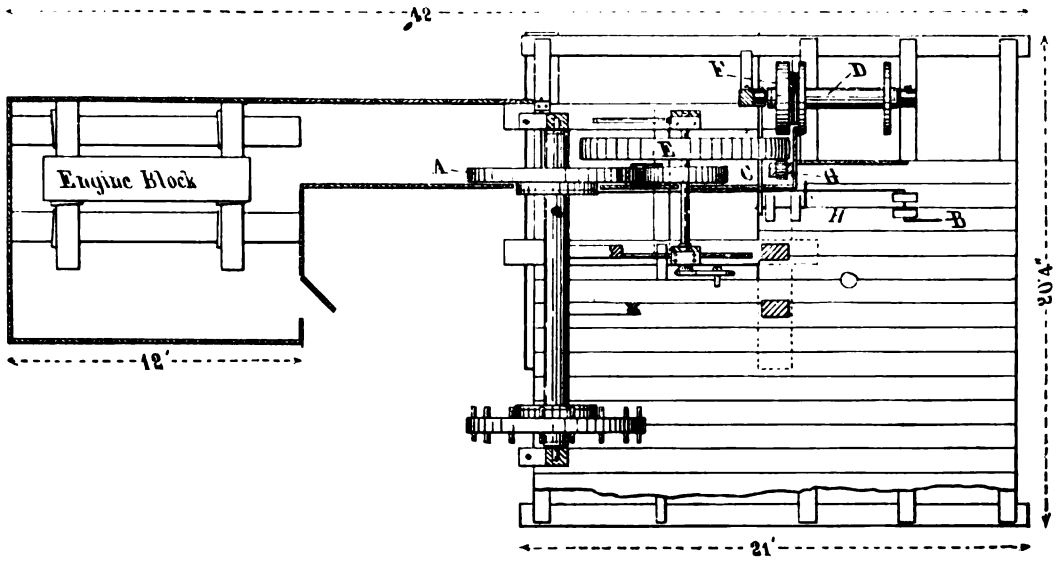


See next page.

COMPACT RIG FOR DEEP WELLS.

BOLTED DERRICK.—GROUND PLAN.

FIGURE 23.



See also figure 22.

This rig is very compact, and yet capable of sinking wells to any practicable depth. The derrick is bolted like that shown in figures 9 and 10. The method of drilling is similar to that described at page 22, and illustrated by figures 5 and 16. When "spudding" or "driving pipe" (page 14 and figure 12), the drilling wheel is removed. The Bull Wheels are operated by a friction pulley. The shaft is so mounted that one end has a slight lateral motion, and one bull wheel, *A*, can be pulled by the lever, *B*, against the friction pulley, *C*, or pushed against the brake band, which by the push of the same lever, *B*, is clasped around the bull wheel.

The sand reel, *D*, is set at right angles to the band wheel, *E*, and the friction pulley, *F*, of the sand reel is pulled against the side of the band wheel by the lever, *H*. The smooth-faced loose pulley, *G*, on the opposite side of the band wheel, *E*, supports it against the pressure of the sand reel.

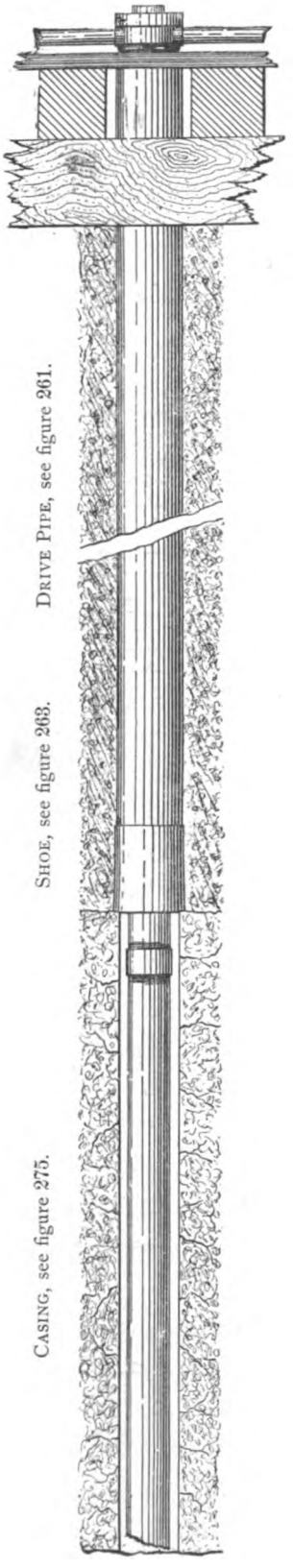
It will be observed that in this rig the well hole is not in the centre of the derrick.

This is the design of GEORGE CORBETT, who has invented many valuable improvements in oil well rigs and apparatus.

IDEAL SECTION OF A PUMPING OIL WELL.

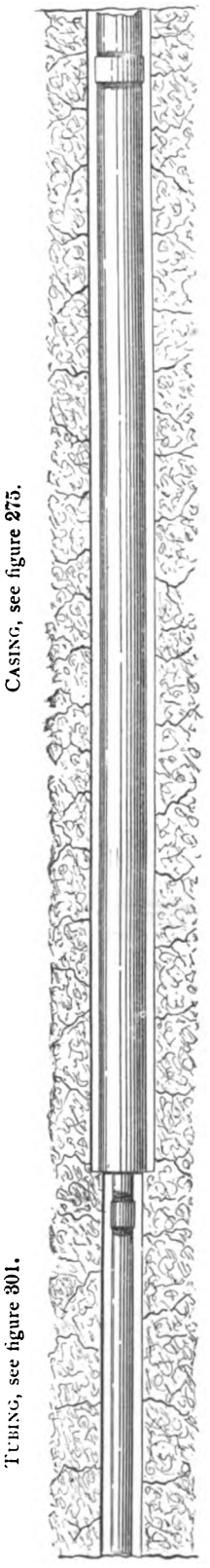
Casing Head, Gas Pipes, Derrick Floor, Derrick Sills, Drive Pipe, Casing.

FIGURE 24.



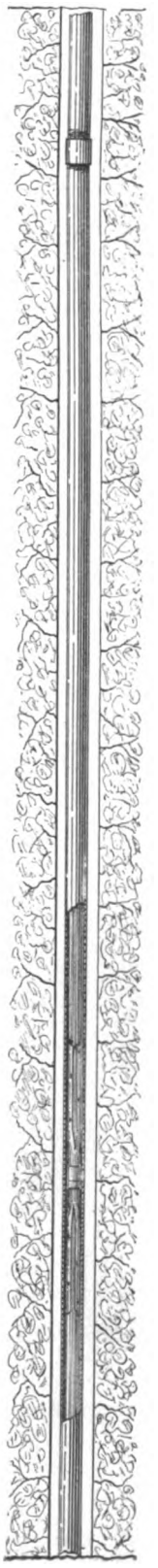
Casing and Tubing.

FIGURE 25.



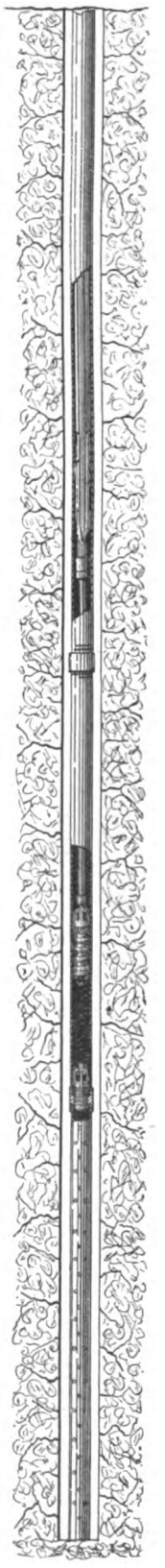
Tubing and Sucker Rods.

FIGURE 26.



Tubing, Sucker Rods, Working Barrel, Valves and Anchor.

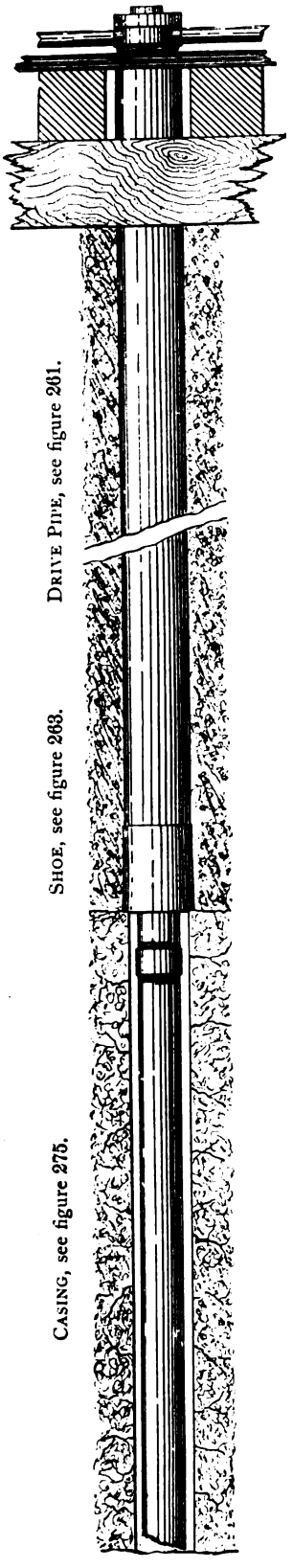
FIGURE 27.



IDEAL SECTION OF A FLOWING OIL WELL.

Casing Head, Gas Pipes,
Derrick Floor, Derrick Sills,
Drive Pipe, Casing.

FIGURE 24.



Casing and Tubing.

FIGURE 25.

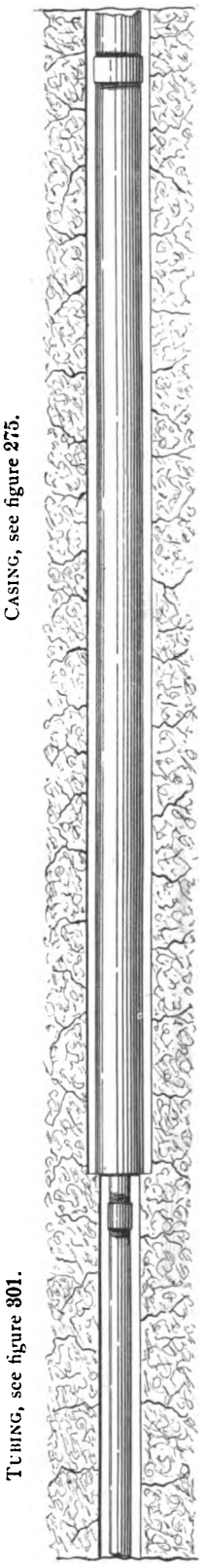
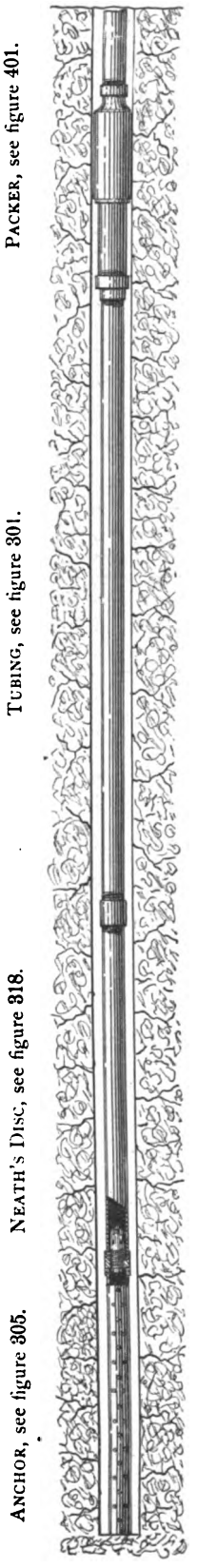
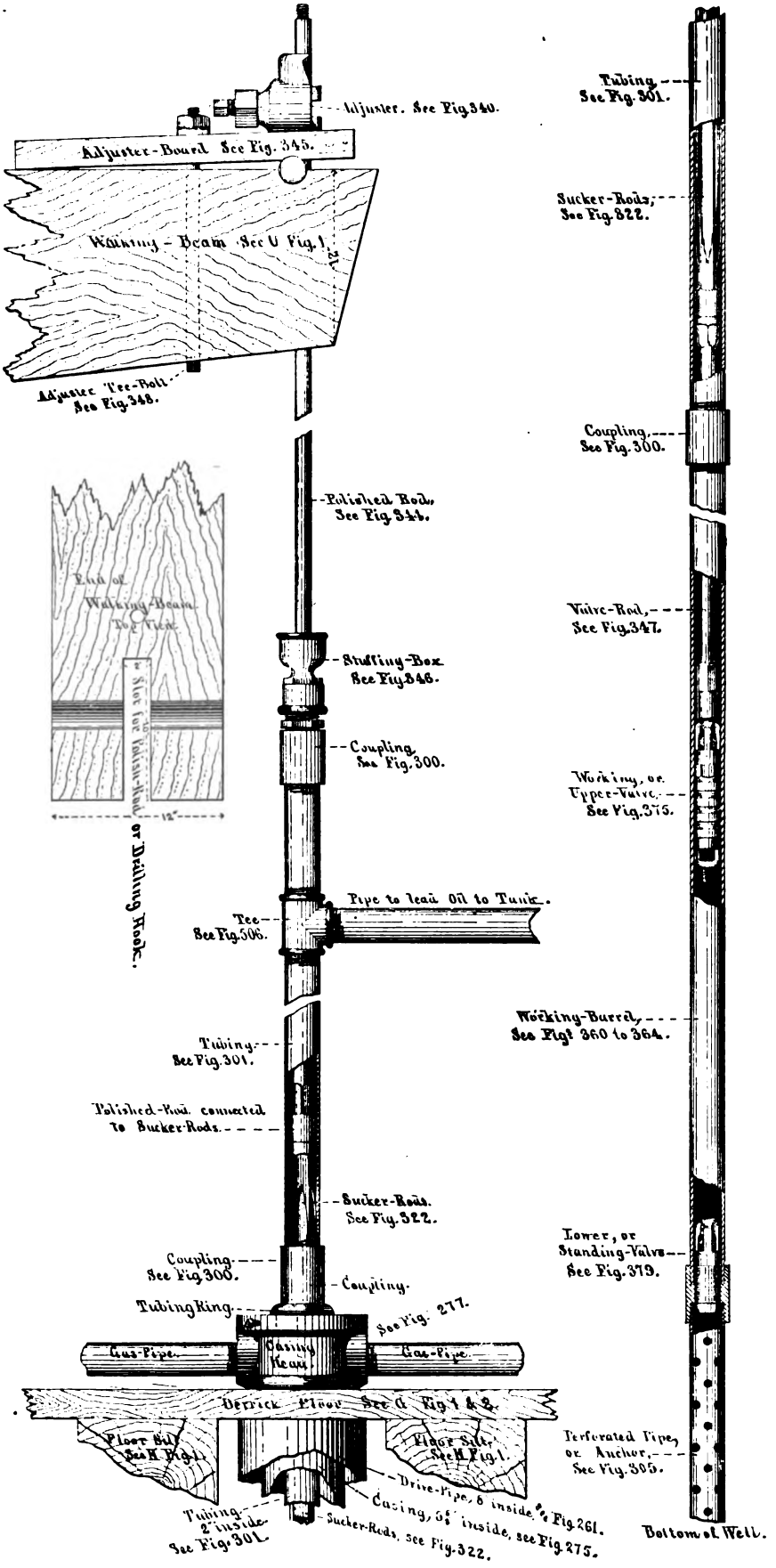


FIGURE 28.



PUMPING WELL.

FIGURE 29.

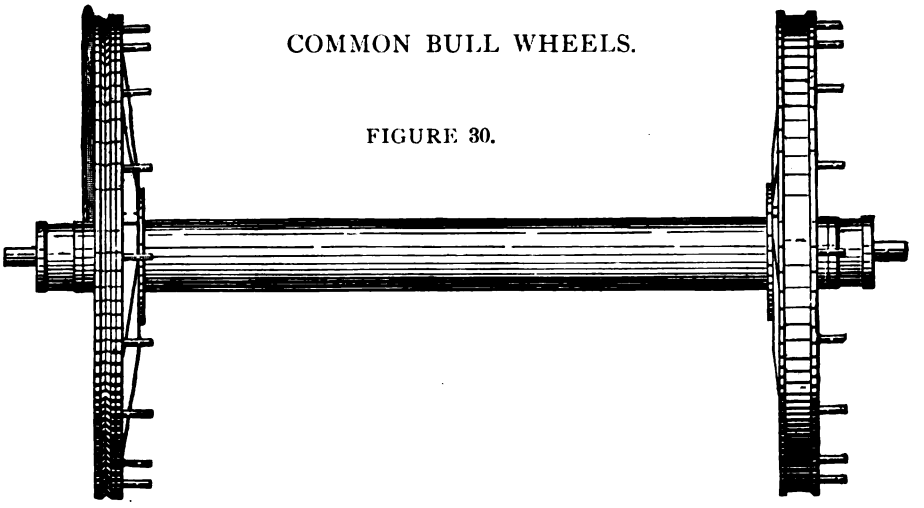


Showing everything used in pumping an oil well, and how the various pumping parts are connected together.

PARTS OF RIG.

COMMON BULL WHEELS.

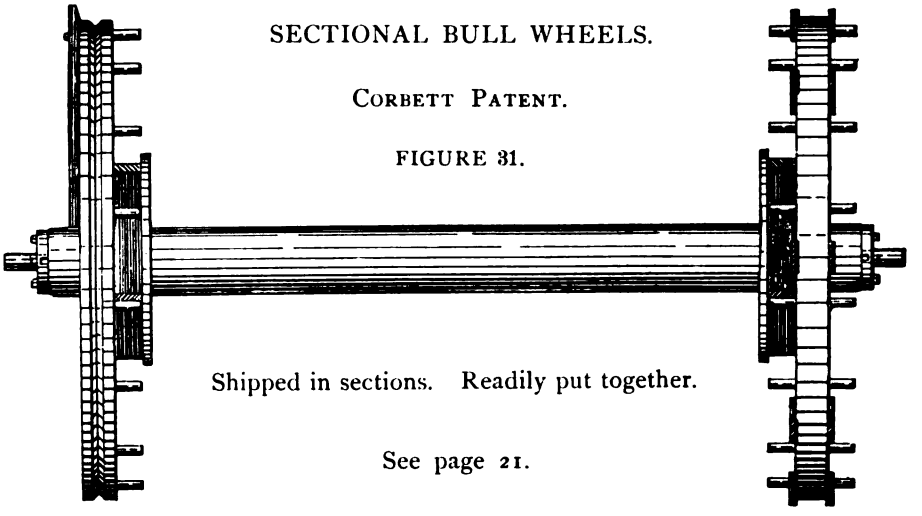
FIGURE 30.



SECTIONAL BULL WHEELS.

CORBETT PATENT.

FIGURE 31.

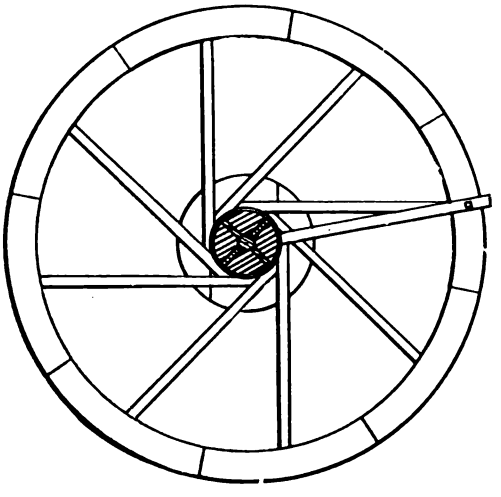


Shipped in sections. Readily put together.

See page 21.

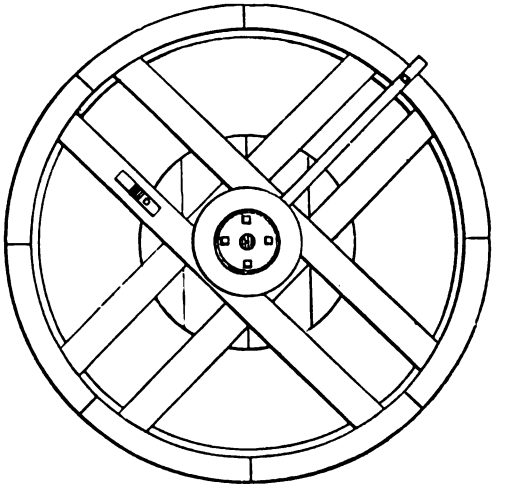
END VIEW OF
FIGURE 30, COMMON BULL WHEEL.

FIGURE 32.



END VIEW OF
FIGURE 31, SECTIONAL BULL WHEEL.

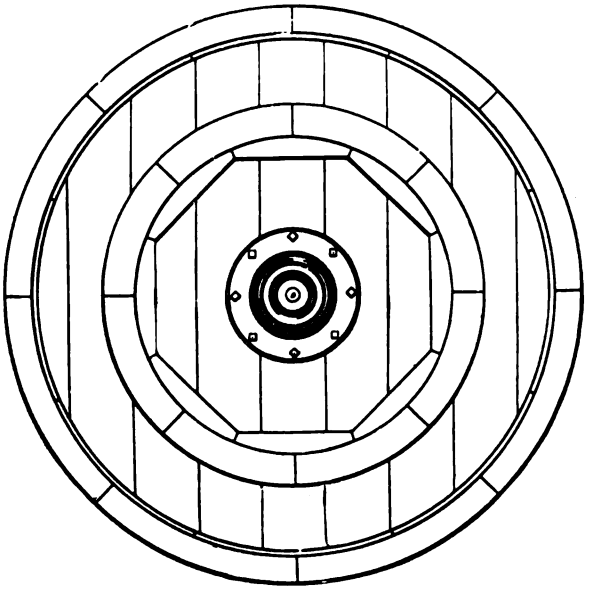
FIGURE 33.



PARTS OF RIG.

COMMON BAND WHEEL WITH TUG PULLEY COMBINED.

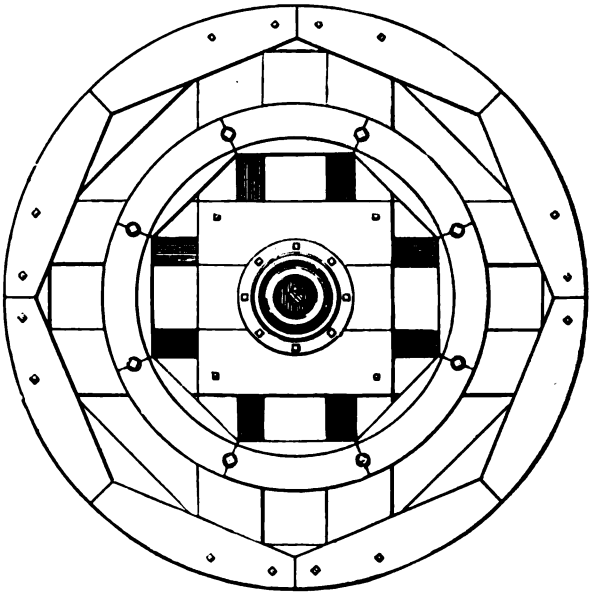
FIGURE 34.



CORBETT'S SECTIONAL BAND WHEEL.

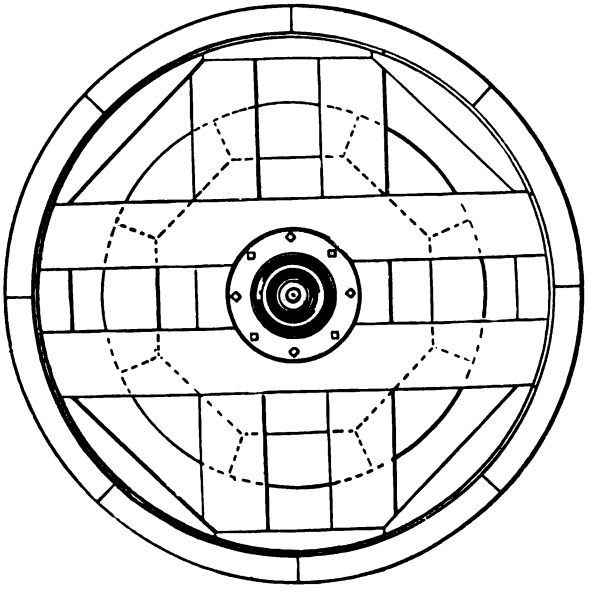
(See page 21.)

FIGURE 35.



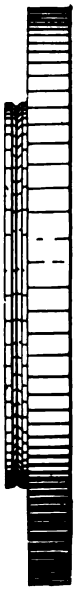
REVERSE OF FIGURE 35.

FIGURE 36.



FACE VIEW OF BAND WHEEL AND TUG PULLEY.

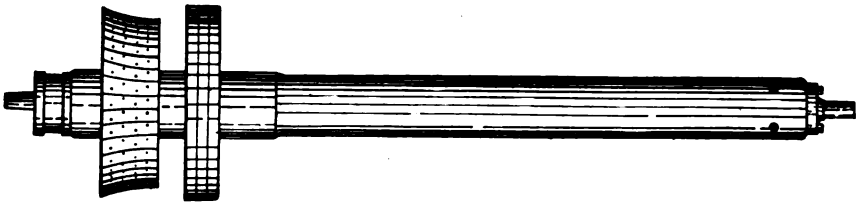
FIGURE 37.



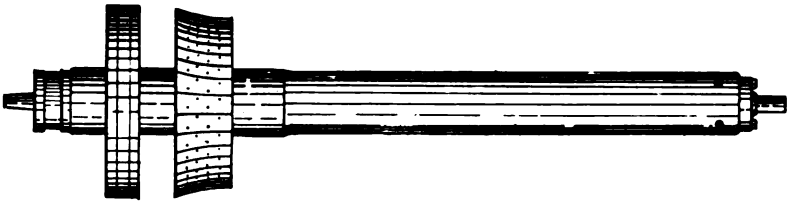
PARTS OF RIG.

SAND PUMP REELS.

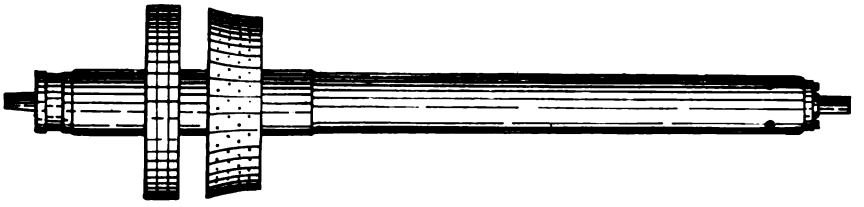
SHORT NOSE. FIGURE 38.



LONG NOSE. FIGURE 39.



EXTRA LONG NOSE. FIGURE 40.



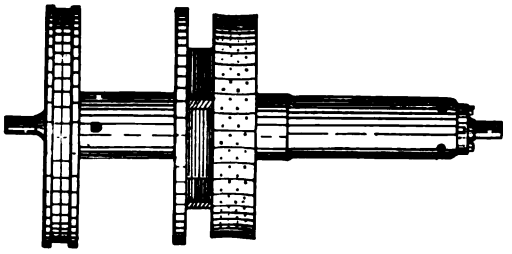


FIGURE 41.

CORBETT'S PATENT SAND PUMP REEL.

See page 22.

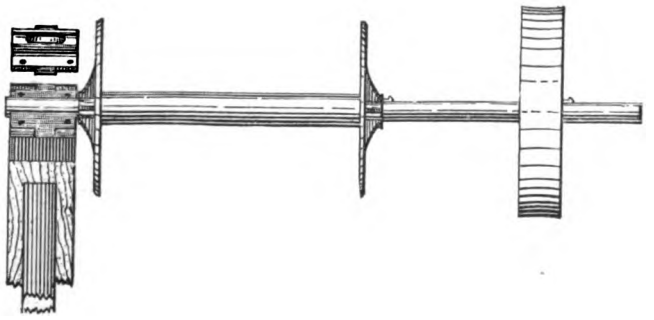


FIGURE 42.

IRON SAND PUMP REEL.

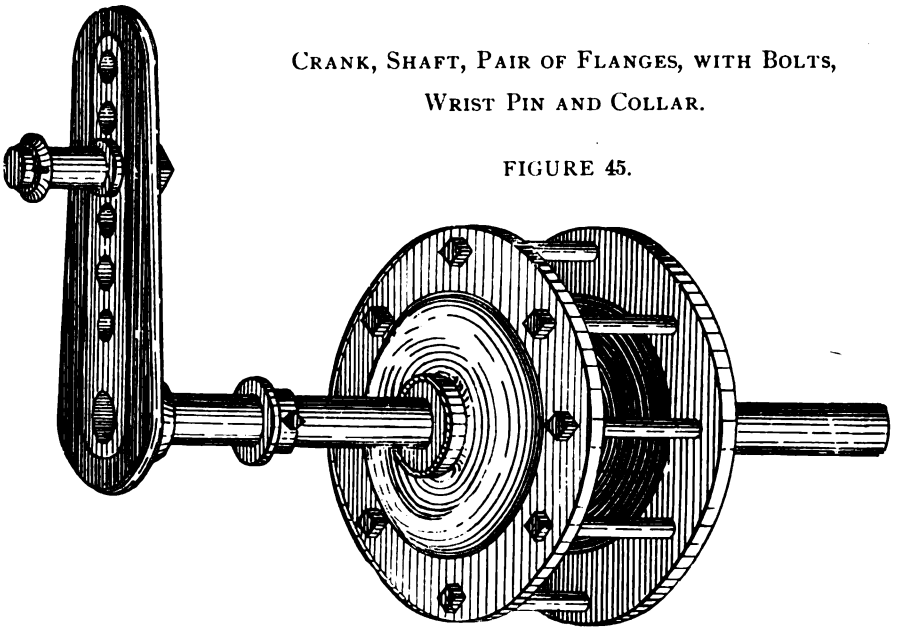
Particularly adapted for warm countries.

PARTS OF RIG.

SET OF RIG IRONS.

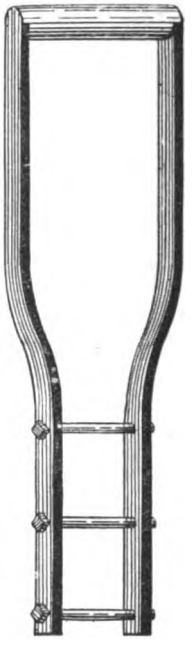
CRANK, SHAFT, PAIR OF FLANGES, WITH BOLTS, WRIST PIN AND COLLAR.

FIGURE 45.



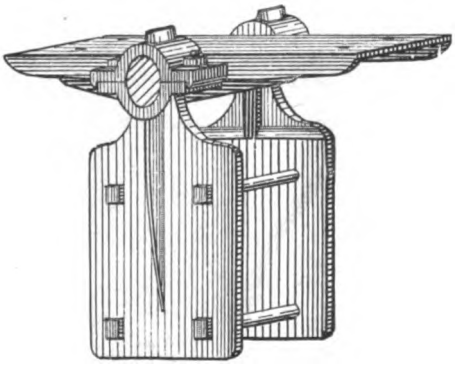
STIRRUP.

FIGURE 46.



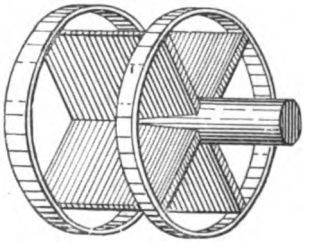
CENTRE IRONS COMPLETE.

FIGURE 47.



GUDGEONS, WITH BANDS.

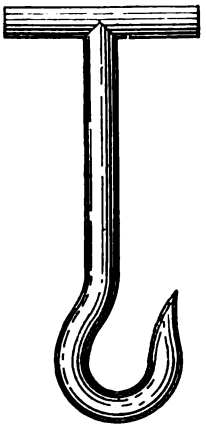
FIGURE 48.



Two with each set of irons.

DRILLING HOOK.

FIGURE 49.

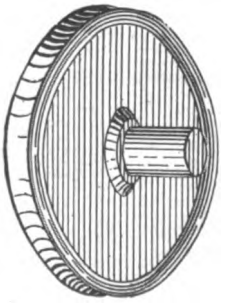


SAND PUMP PULLEY.

FIGURE 50.

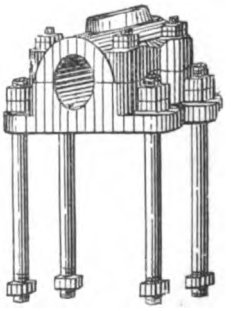
DERRICK OR CROWN PULLEY

FIGURE 51.



JACK POST BOX COMPLETE.

FIGURE 52.



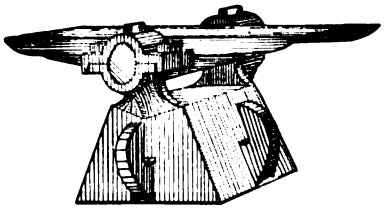
Two with each set of irons.

PARTS OF RIG.

RAIFSNYDER'S PATENT CENTRE IRONS AND JACK POST BOXES.

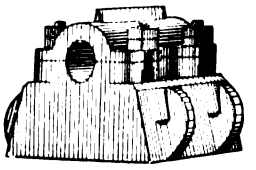
CENTRE IRONS.

FIGURE 60.



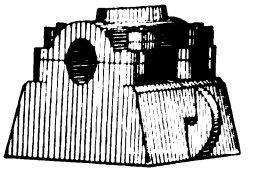
JACK POST BOXES.

FIGURE 61.



For 4 Guy Rods.

FIGURE 62.

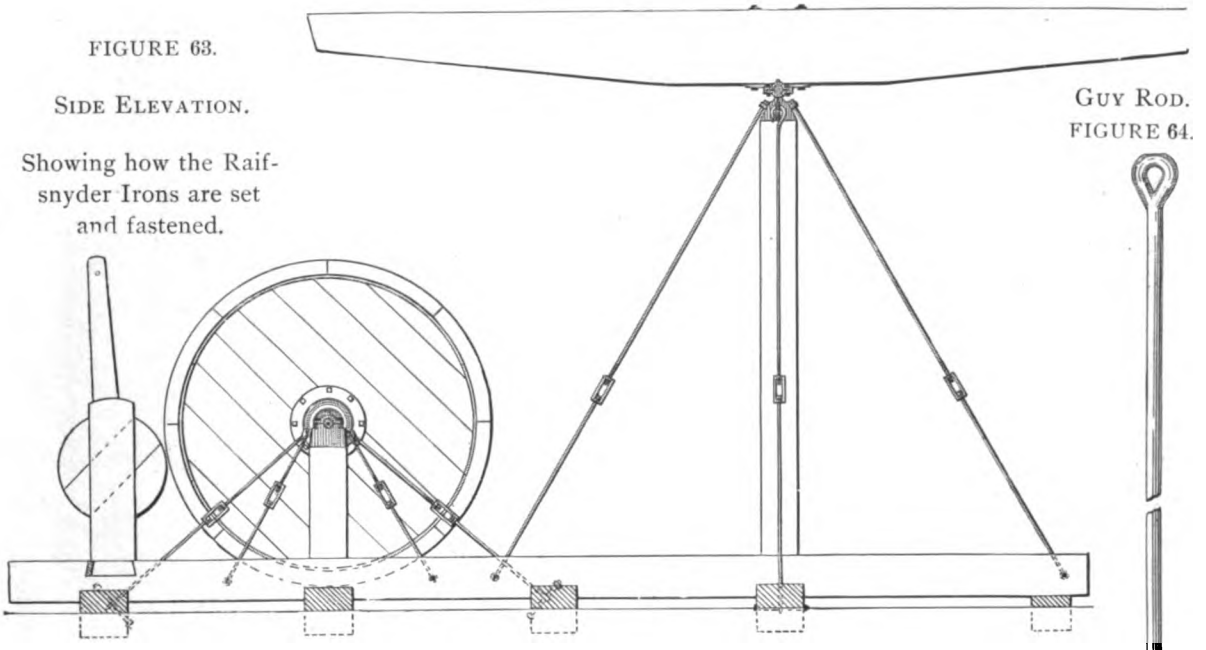


For 2 Guy Rods.

FIGURE 63.

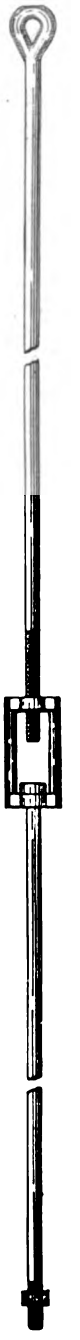
SIDE ELEVATION.

Showing how the Raifsnyder Irons are set and fastened.



GUY ROD.

FIGURE 64.



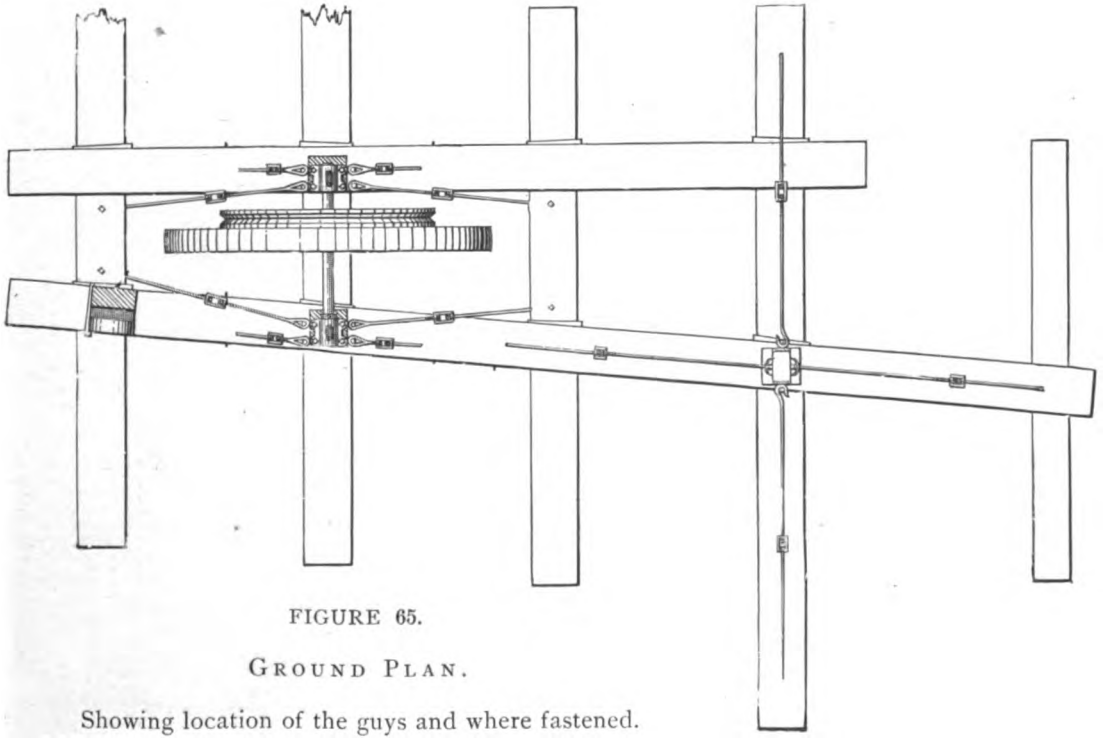


FIGURE 65.

GROUND PLAN.

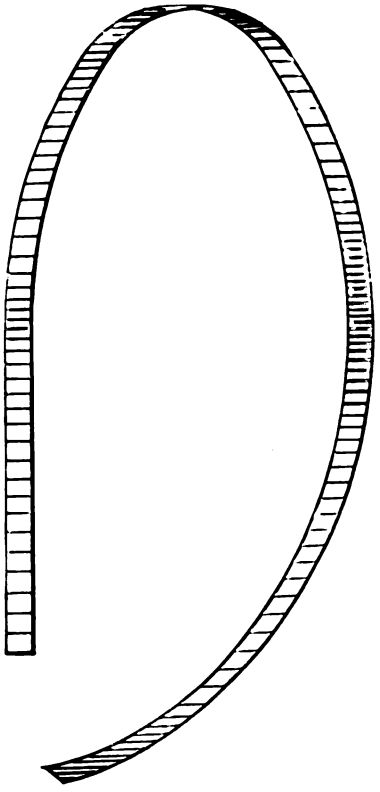
Showing location of the guys and where fastened.

Much lighter timbers can be used with these irons than with the common irons, and the rig will be stronger, stiffer and more durable.

SET OF BRAKE IRONS.

BRAKE BAND.

FIGURE 70.



BRAKE LEVER.

FIGURE 71.

BRAKE STAPLE.

FIGURE 72.

BACK BRAKE.

FIGURE 73.

BULL ROPE COUPLINGS.

COMMON.

FIGURE 74.

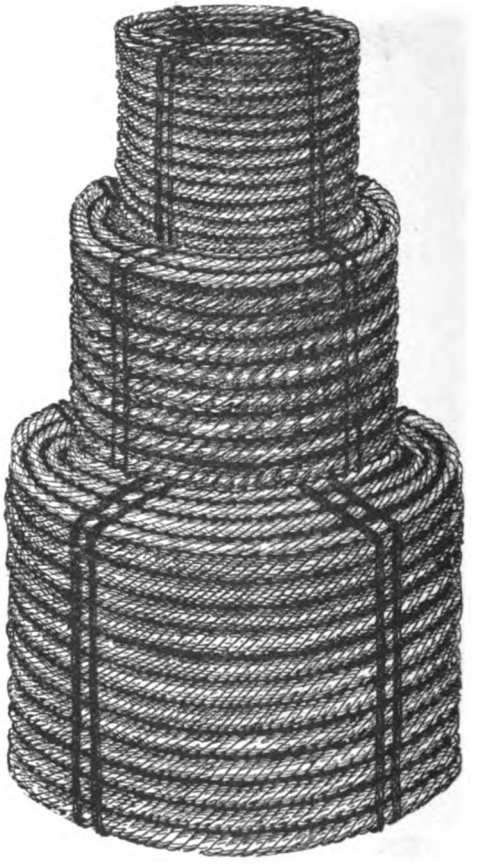
ROGERS' PATENT.

FIGURE 75.

ROPES.

CABLE, BULL ROPE AND SAND LINE.

FIGURE 76.



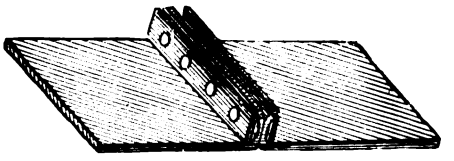
BELT CLAMPS.

FIGURE 77.

BELT CLAMP,

WITH SECTION OF BELT.

FIGURE 78.



OIL WELL TORPEDOES.

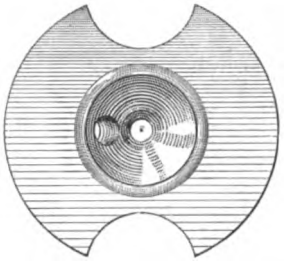
(See page 20.)

DROP WEIGHT OR GUIDE LINE.

FIGURE 79.

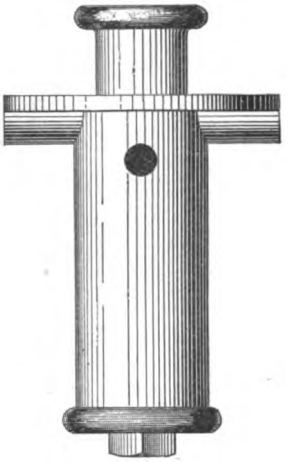
TORPEDO TOP PLATE.

FIGURE 80.



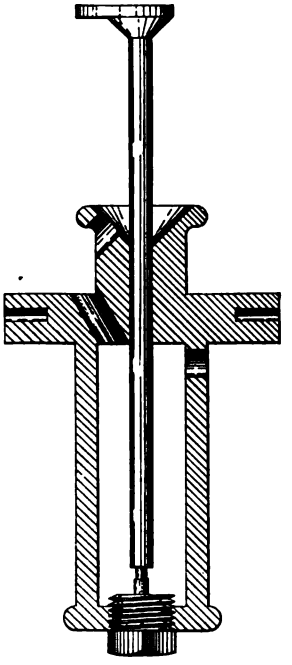
FIRING HEAD.

FIGURE 81.



SECTION OF FIRING HEAD.

FIGURE 82.



"GO DEVIL."

FIGURE 83.

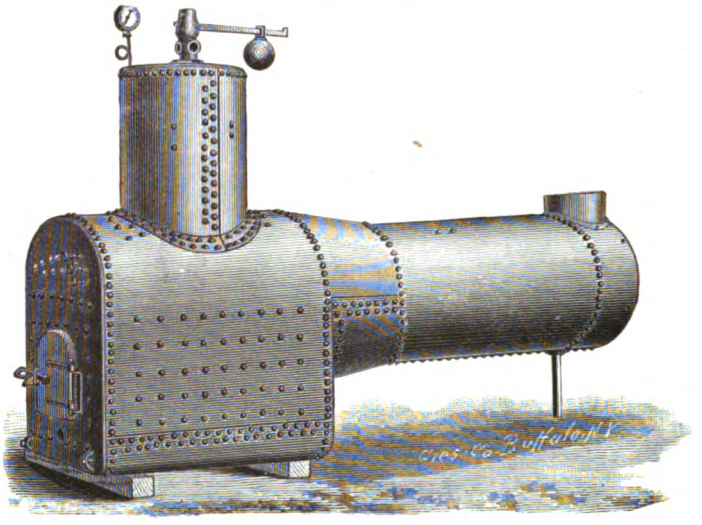
"GO DEVIL" TORPEDO, WITH ANCHOR.

BOILERS AND ENGINES.

(See page 12.)

PORTABLE BOILER FOR DRILLING WELLS.

FIGURE 100

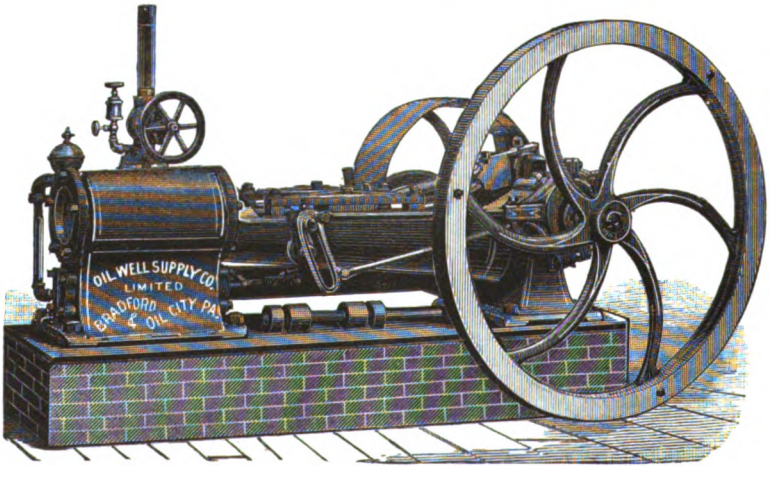


Horse Power	10	12	15	20	25	30	40	50
Diameter of Boiler ... in inches,	24	28	30	36	40	44	48	48
Length of Furnace inside ... "	38	44	48	50	50	53	53	61
Width of Furnace inside ... "	26	30	32	36	40	44	48	48
Height of Furnace above Grate ... "	26	30	34	36	40	44	48	50
Number of Tubes (3 in. diameter)	26	28	29	38	48	54	60	60
Length of Tubes ... in inches,	72	78	90	96	96	108	120	144
Height of Dome ... "	20	22	24	34	36	36	36	36
Diameter of Dome ... "	20	22	24	30	36	36	36	36
Diameter of Stack ... "	14	14	16	18	20	22	26	26
Length of Stack ... in feet,	16	18	24	25	25	30	30	40

Fixtures for above Boilers comprise Grates, Steam Gauge, Gauge Cocks, Safety Valve, Blow-off, Check and Stop Valves, Smoke Stack and Guy Rods.

ENGINE FOR DRILLING WELLS.

FIGURE 105.

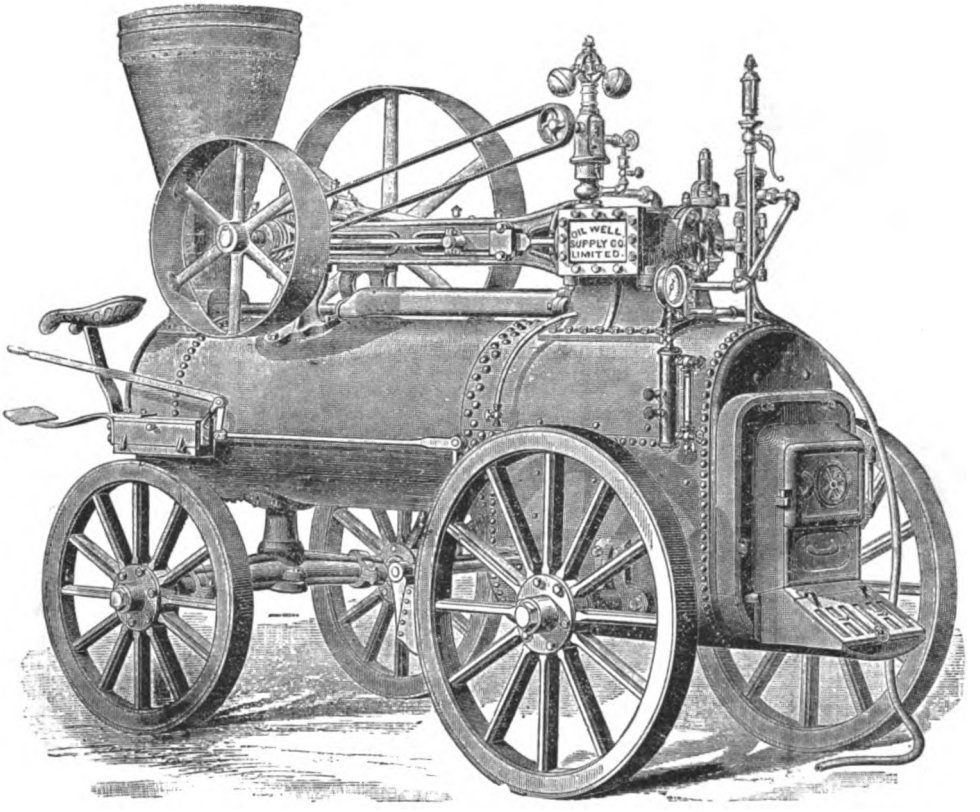


Horse Power	12	15
Diameter of Cylinder ... in inches,	8	9½
Length of Stroke ... "	12	12

Ordinary size of Boiler used for Drilling ... 20 Horse Power.
" " Engine " " ... 15 " "

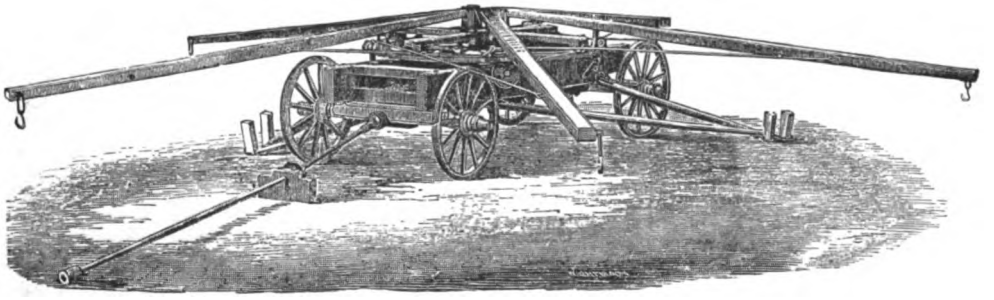
PORTABLE ENGINE.

FIGURE 110.



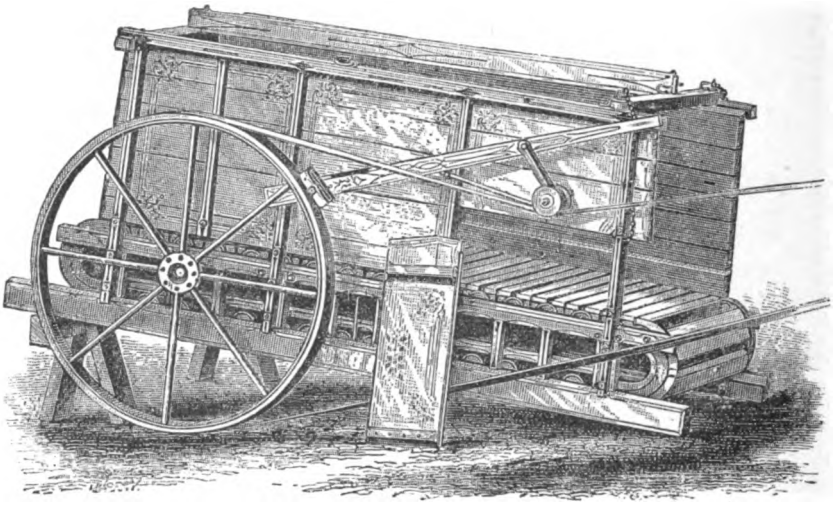
HORSE POWER.

FIGURE 111.



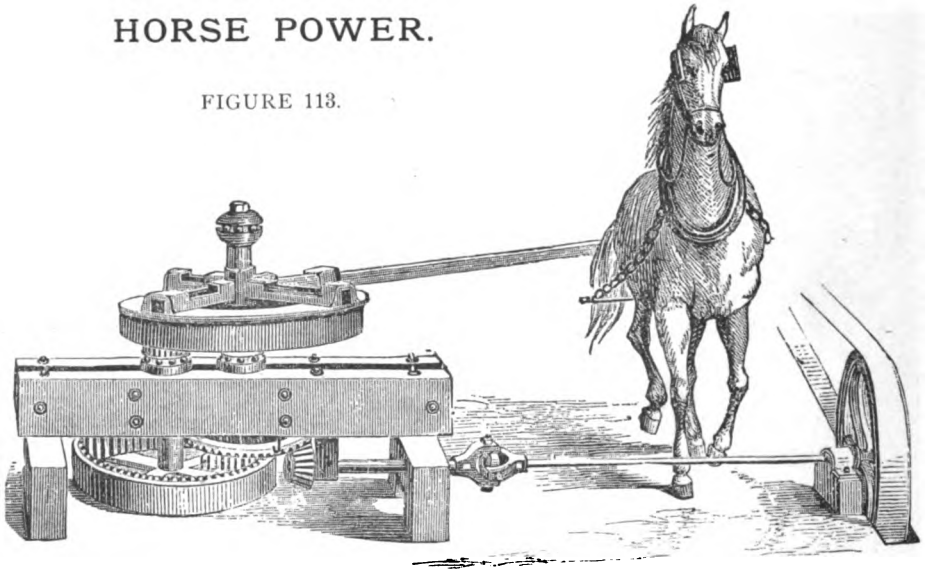
HORSE POWER.

FIGURE 112.



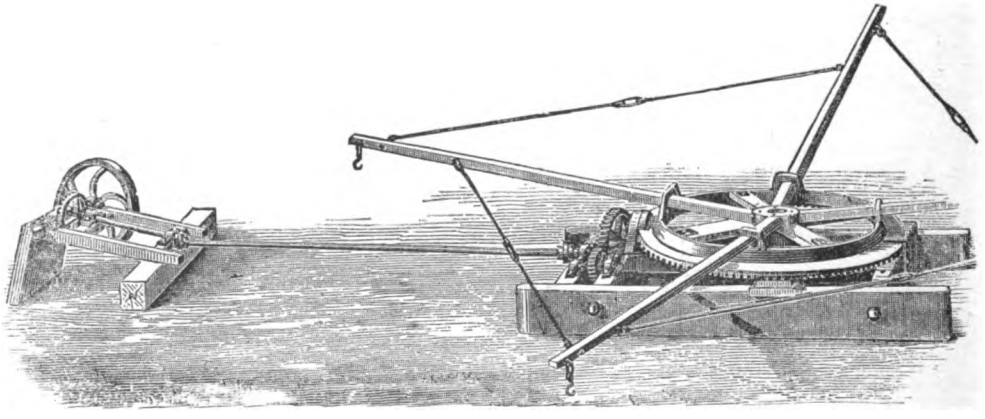
HORSE POWER.

FIGURE 113.



HORSE POWER.

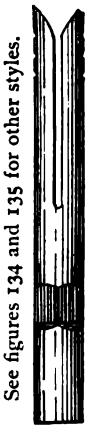
FIGURE 114.



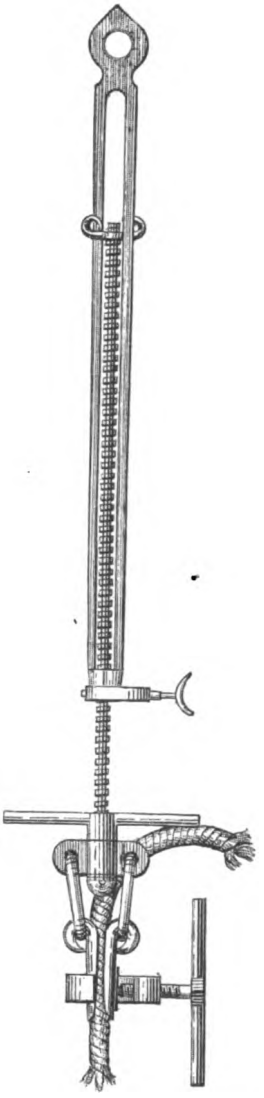
SET OF DRILLING TOOLS.

(See pages 12 and 13)

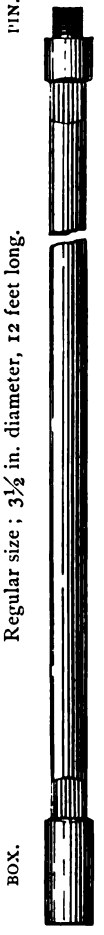
WING ROPE SOCKET.
FIGURE 115.



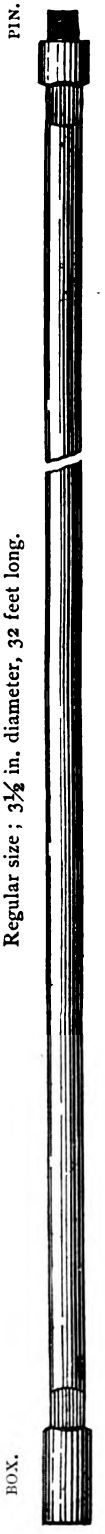
TEMPER SCREW.
FIGURE 116.



SINKER BAR.
FIGURE 117.

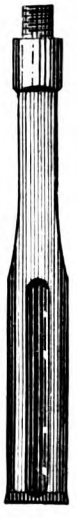


AUGER STEM.
FIGURE 118.

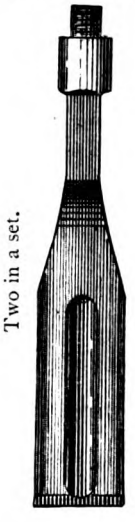


JARS.
FIGURE 119.

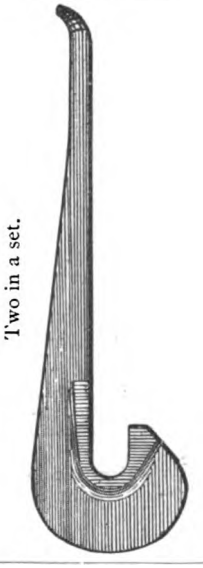
SMALL BIT.
FIGURE 120.



LARGE BIT.
FIGURE 121.



WRENCH.
FIGURE 122.



TOOL GAUGE.
FIGURE 123.

One for each size of bit.

MISCELLANEOUS DRILLING TOOLS.

PATENT TAPER JOINT.

FIGURE 125.

Alexander Patent.

This joint has double the strength of the common joint, and costs but little more. (See page 13.)

PIN.

FIGURE 126.

BOX.

FIGURE 127.

To replace broken ones.

SUBSTITUTE.

FIGURE 128.

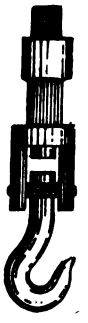
To unite a tool having one size thread to another with a different thread.

HOOK.

FIGURE 129.

SWIVEL HOOK.

FIGURE 130.



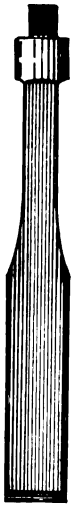
SWIVEL BOX.

FIGURE 131.

For elevating tools in the derrick.

FLAT BIT.

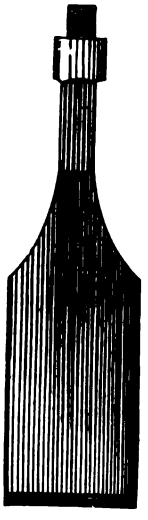
FIGURE 132.



Sometimes preferred to the regular bits, shown in figures 120 and 121.

SPUDDING BIT.

FIGURE 133.



For drilling in the earth down to the rock.

PATENT ROPE SOCKET.

FIGURE 134.

PATENT WING ROPE SOCKET.

FIGURE 135.

See Figure 115.

Any kind given with set of tools, as desired.

MISCELLANEOUS DRILLING TOOLS.

ROUND REAMER.

FIGURE 136.

To straighten a crooked hole.

STAR REAMER.

FIGURE 137.

To straighten a crooked hole.

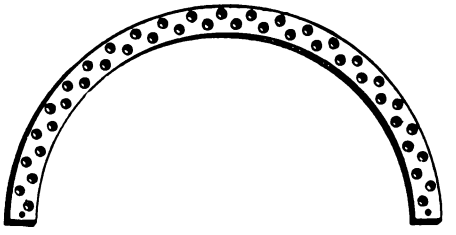
SPECTACLES.

FIGURE 138.

For carrying tools.

WRENCH CIRCLE.

FIGURE 139.



To hold wrench bar when screwing and unscrewing tools. (See page 15.)

STAR BITS.

WINGED SUBSTITUTE.

FIGURE 140.

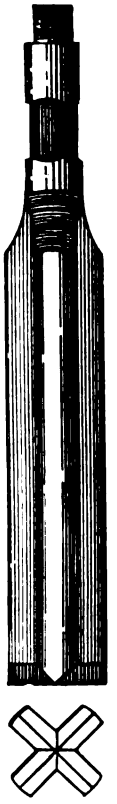
Sometimes placed just above the bit to keep it from glancing off, also above the round reamer to keep it to its place.

THREE WINGS.

FIGURE 141.

FOUR WINGS.

FIGURE 142.



To keep a hole straight when drilling in rock that has crevices, or where the strata are inclined. The bits being long and nearly the full size of the hole are not liable to glance.

FISHING TOOLS.

HORN SOCKET,

With or without ADJUSTABLE BOWL.

FIGURE 150.

For small hole, without Bowl.

Adjustable Bowl for large hole.

To take hold of any loose tools in the well.

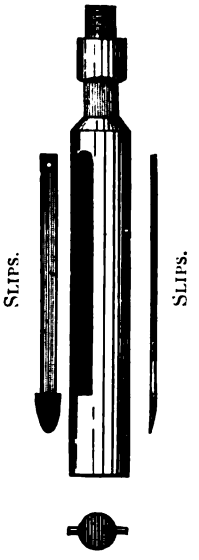
LONG FRICTION SOCKET.

FIGURE 151.

To seize jars or other tools when they are loose in the well. It takes a stronger hold than the horn socket.

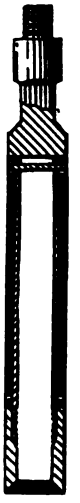
SLIP SOCKET.

FIGURE 152.



SECTION OF SLIP SOCKET.

FIGURE 153.



To take hold of any tool when the box or pin is broken off.

MUD SOCKET.

FIGURE 154.

For cleaning mud or sand out of a well. Is used on a set of tools.

PIN SOCKET.

FIGURE 155.

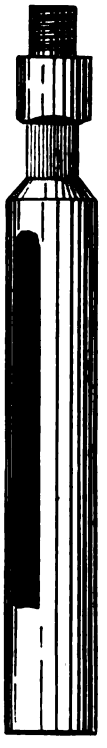
SECTION OF PIN SOCKET.

FIGURE 156.

To take hold of a pin when unscrewed from the box.

COLLAR SOCKET.

FIGURE 160.



To take hold of a collar when pin is broken off or unscrewed.

SHORT FRICTION SOCKET.

FIGURE 157.

SECTION OF FRICTION SOCKET.

FIGURE 158.

To take hold of any other tool where a strong friction hold is required. It is made of steel, is very strong and will stand heavy jarring.

COMBINATION SOCKET.

FIGURE 159.

To take hold of pin, collar, shank, or rope socket.

FISHING TOOLS.

ROPE SPEAR.

FIGURE 161.

To catch end of the rope when it has parted in the well.

TWO WING ROPE GRAB.

FIGURE 162.

THREE WING ROPE GRAB.

FIGURE 163.

To take hold of the rope when it is broken off in the well.

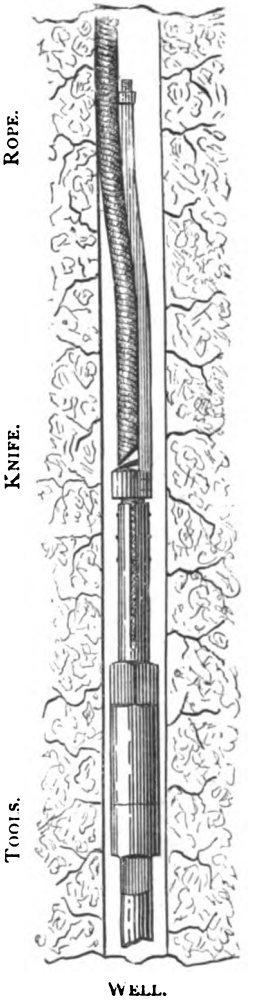
SUCKER ROD JAR.

FIGURE 164.

To attach to sucker rods for cutting rope in the well.

FIGURE 169.

Showing rope knife cutting off rope in the well.



ADJUSTABLE ROPE KNIFE.

FIGURE 166.

To be used on a string of sucker rods.

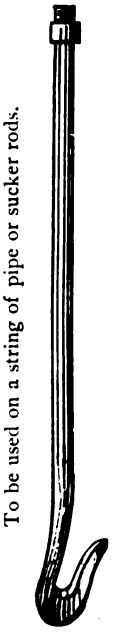
V. ROPE KNIFE.

FIGURE 167.

To be used on a string of sucker rods.

HOOK ROPE KNIFE.

FIGURE 168.



To be used on a string of pipe or sucker rods.

To cut the rope when the tools are fast in the well.

VALVE ROPE KNIFE.

FIGURE 165.

Used on a string of sucker rods.

FISHING TOOLS.

MOUSE TRAP.

FIGURE 170.

For cutting and fishing out rope when matted in the well; it will also take out small pieces of iron or steel, or any small object.

HOLLOW REAMER.

FIGURE 171.

Used to straighten a crooked hole, also to remove the earth and sediment around tools when they are fast, the object being to make room enough for the fishing tool to take hold.

GRAB.

FIGURE 172.

To take hold of any loose tool, below the collar, when box or pin is broken off.

BOOT JACK.

FIGURE 173.

To take hold of lower half of jars, under the head, when the upper half is broken off.

TUBING SPEAR AND SOCKET.

FIGURE 174.

To screw on drilling tools.

TUBING SPEAR AND SOCKET.

FIGURE 175.

To screw on tubing.

To take out tubing when unscrewed or broken off.

JAR SOCKET.

FIGURE 176.

To take hold of the lower reins of jars when the head is broken.

SAND PUMP OR BAILER GRAB.

FIGURE 177.

To take out sand pump or bailer when lost in the well.

FISHING TOOLS.

SPUD

FOR SMALL HOLE.

FIGURE 178.

SPUD

FOR LARGE HOLE.

FIGURE 179.

For spudding around and loosening a bit or reamer when fast in the well, if disconnected from the rest of the tools.

SPEAR.

FIGURE 180.

Made from 40 to 60 feet in length.

For spudding around and loosening the whole or a part of a set of tools when fast in the well.

FISHING TOOLS.

HOOKS FOR STRAIGHTENING BIT OR REAMER.

FIGURE 181.

FRONT.

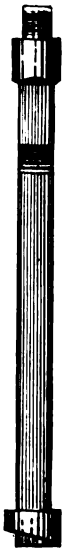


FIGURE 182.

SIDE.

To straighten up a bit or reamer lost in the well when it lies against or has been jammed in the wall—the hook goes around the shank.

ALLIGATOR GRAB.

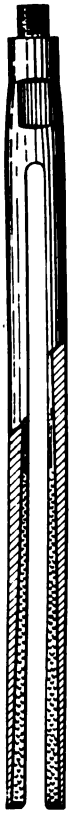
FIGURE 183.

To take hold of a piece of steel or other small article that has been lost in the well.

RASP.

TWO WINGS.

FIGURE 184.



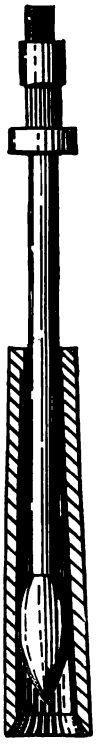
For rasping or reducing the size of a box or collar on lost tools, so that a fishing tool can take hold.

MANDREL SOCKET.

FIGURE 185.

SECTION OF MANDREL SOCKET.

FIGURE 186.



To take hold of casing that has collapsed or become broken in the well.

GRAB FOR PACKER RUBBER.

FIGURE 187.

To take out rubber that has come off of the packer.

FISHING TOOLS.

SUCKER ROD SPEAR.

FIGURE 188.

To take hold of sucker rods under the collar when broken off or disconnected in the well.

TWIST DRILL.

FIGURE 189.

When the top of a lost tool has been battered down so large that it fills the hole, and there is not room for a fishing tool to take hold, this drills a hole in the top in which is inserted the Twist Drill Spear, figure 190. Used on tubing.

TWIST DRILL SPEAR.

FIGURE 190.

To catch a lost tool after the Twist Drill, figure 189, has made a hole. Used on tools.

VALVE CUP GRAB.

FIGURE 191.

To take out valve cups when they have dropped from the valve.

ROPE WORM.

FIGURE 192.

To take rope out of tubing.

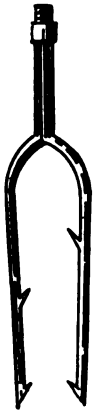
JAR KNOCKER.

FIGURE 193.

To knock jars loose when locked together in the well.

SUCKER ROD ROPE GRAB.

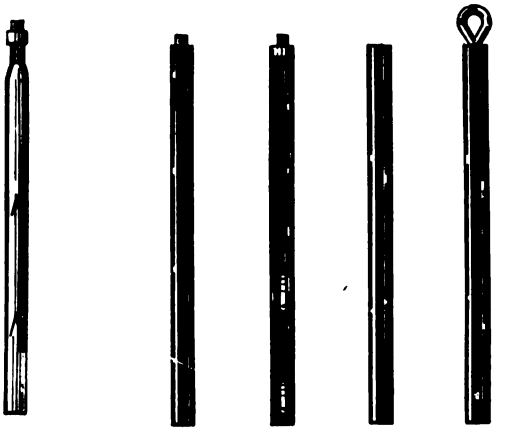
FIGURE 194.



To take out rope when broken off in well. Used on sucker rods.

SUCKER ROD SOCKET.

FIGURE 195. FIGURE 196.



To take sucker rods out of a well when broken off or disconnected.

FISHING TOOLS, &c.

CASING SPEARS.

PATENT.

FIGURE 197.

COMMON.

FIGURE 198.

To pull casing when fast.

CASING SPLITTER.

SIDE.

FIGURE 199.

FRONT.

FIGURE 200.

For splitting casing to let the dirt and sediment around it run into the well, so that the casing which has been fastened thereby may be removed.

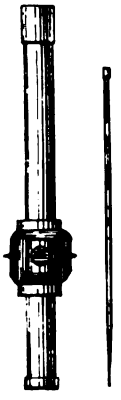
CASING CUTTERS.

PATENT.

FIGURE 201.

COMMON.

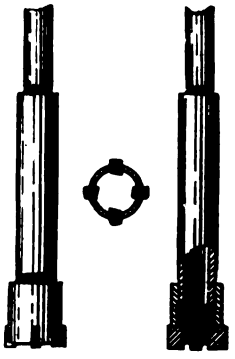
FIGURE 202.



To cut casing at any point in the well, when it is fastened and cannot otherwise be pulled.

MILLING TOOL.

FIGURE 203.



To renew the pin on tools in the well when it has been broken off.

TUBING RING, WITH WEDGES.

FIGURE 204.

To prevent tubing's dropping in the well while pulling it. It fits in the casing head (figure 276).

TOOL REST.

FIGURE 205.

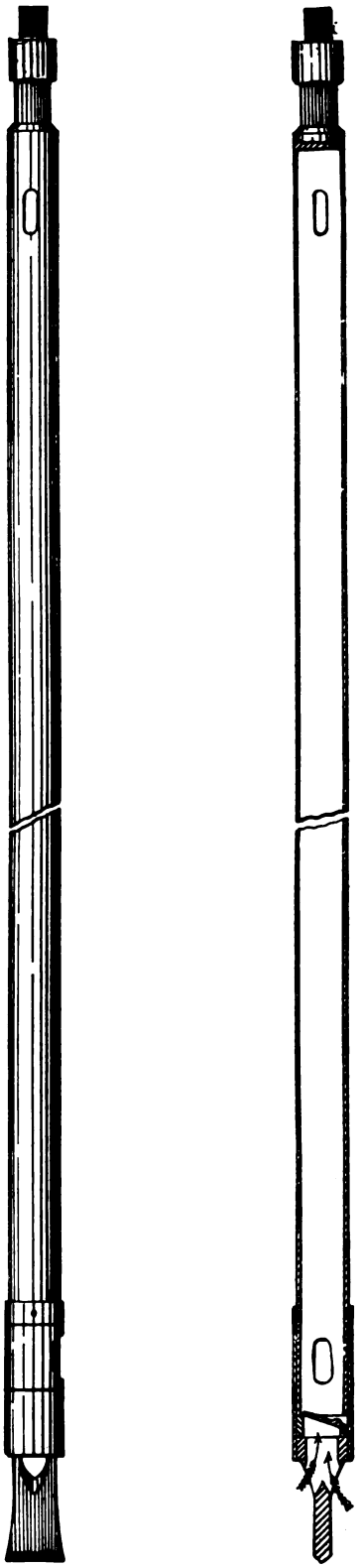
To rest tools on when screwing or unscrewing them.

FOR DRILLING AND CLEANING OUT.

COMBINATION BIT AND MUD SOCKET.

FIGURE 206. FIGURE 207.

SECTION.



To clean mud and sediment out of old wells. The bit loosens the mud, which is forced into the tube and thus removed.

MOODY'S PATENT SAND PUMP.

FIGURE 208.

FIGURE 209.—SECTION.

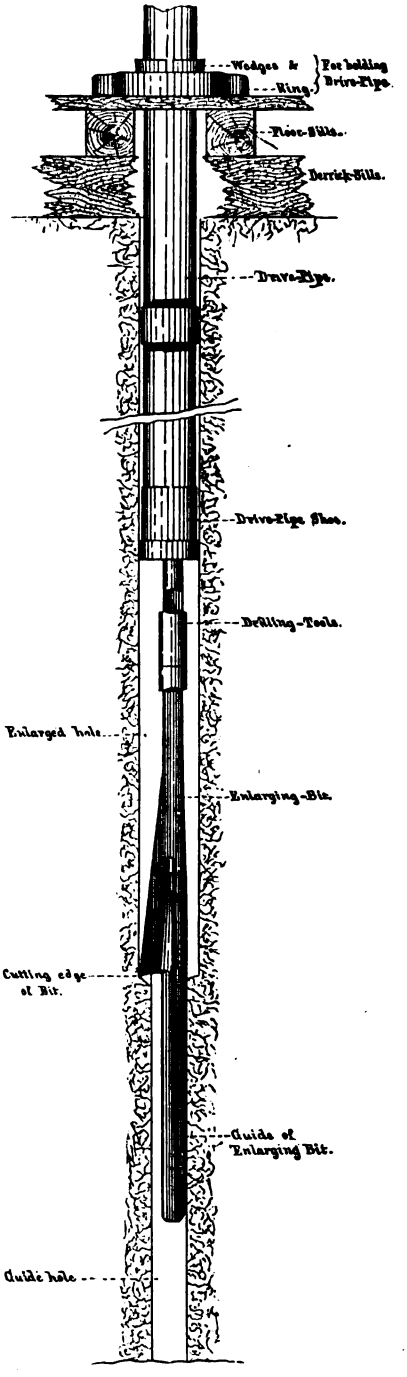
For cleaning out old wells. The bailer is forced into the mud by jarring, and the mud is forced into the tube by the hydrostatic pressure of the water.

CLARY'S PATENT ENLARGING BIT.

FIGURE 210.

SHOWING THE WORKING OF THE ENLARGING BIT.

FIGURE 211.

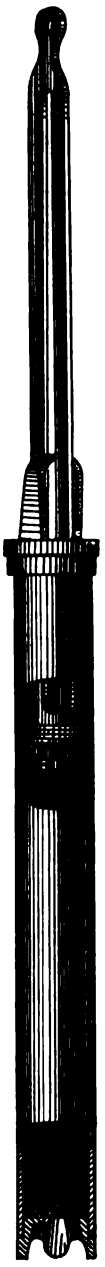


This bit drills ahead of the drive pipe, so as to make a hole the full size of the drive pipe through hard rock. A hole about four inches smaller than the outside diameter of the pipe is drilled ahead for the guide of the enlarger. The drive pipe is then drawn up about four feet, to give room for the stroke of the bit, and there held by the ring and wedges shown in figure 266. The bit being let down through the pipe, the guide enters the small hole and thrusts the bit outwardly. By rotation of the bit the hole will be enlarged to the outside size of the drive pipe. This is the only practical tool that has ever been made for this purpose. It is effective in inexperienced hands, and is always in order.

SAND PUMPS, BAILERS, &c.

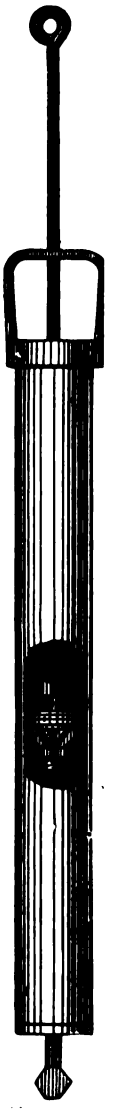
SAND PUMPS.

MORAHAN PATENT SAND PUMP. FIGURE 225.



SMITH, OR COMBINATION SAND PUMP. FIGURE 226.

ROBERTS' PATENT SAND PUMP. FIGURE 227.



ROBERTS' PATENT SAND PUMP.—SWIVEL BAIL. FIGURE 228.

PLUNGER FOR MORAHAN SAND PUMP. FIGURE 229.

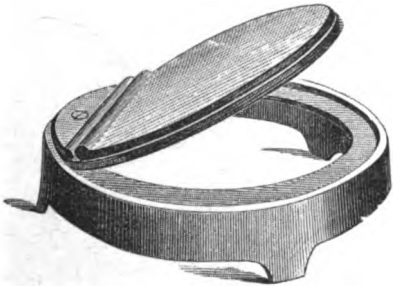
BAILER.

WROUGHT IRON BAILER. FIGURE 230.

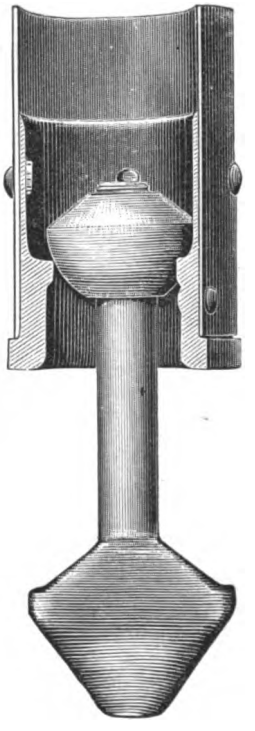
BAILER BAIL.

FIGURE 232.

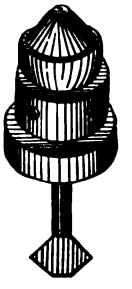
CLAPPER VALVE FOR SAND PUMP. "MORAHAN." FIGURE 231.



BIRGE'S PATENT DART VALVE FOR SAND PUMPS. FIGURE 233.



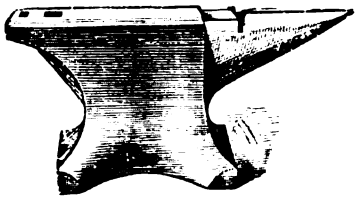
COMMON. DART VALVE. FIGURE 234.



TOOLS FOR THE FORGE, &c.

ANVIL.

FIGURE 240.

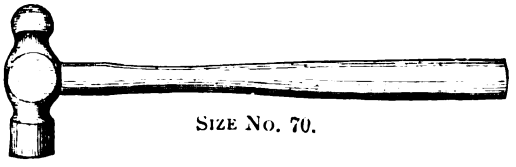


BLACKSMITH'S TONGS.

FIGURE 241.

BALL PEEN HAMMER.

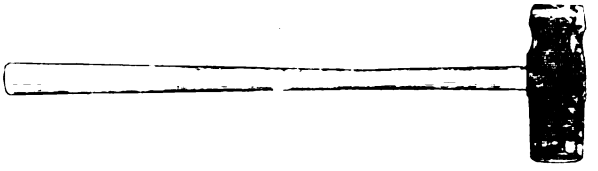
FIGURE 242.



SIZE No. 70.

BLACKSMITH'S SLEDGE.

FIGURE 243.



PULLEYS FOR FORGE.

FIGURE 245.

3-INCH.

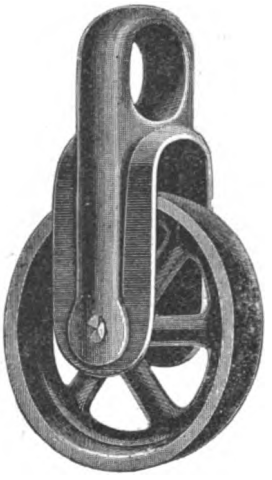
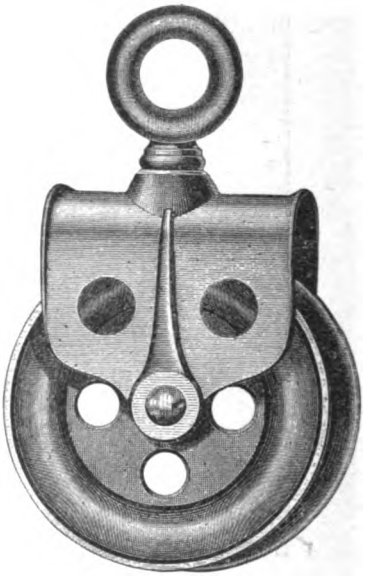


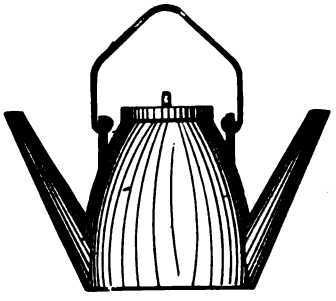
FIGURE 246.

5-INCH.



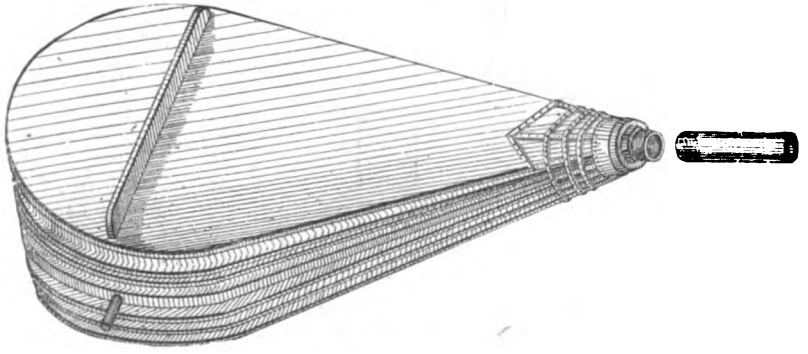
DERRICK LAMP.

FIGURE 244.



BELLOWS.

FIGURE 247.



GROOVED WHEELS.

For Telegraph and Reverse Lines.

FIGURE 248. No. 1.

FIGURE 249. No. 2.

DRIVE PIPE, &c.

WOODEN CONDUCTOR.

OCTAGON.

FIGURE 260.

Used instead of drive pipe when the rock is near the surface.

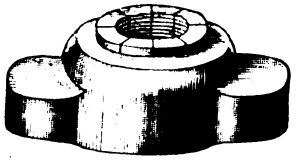
DRIVE PIPE SWEDGE.

FIGURE 265.

To straighten pipe.

DRIVE PIPE RING AND WEDGES.

FIGURE 266.

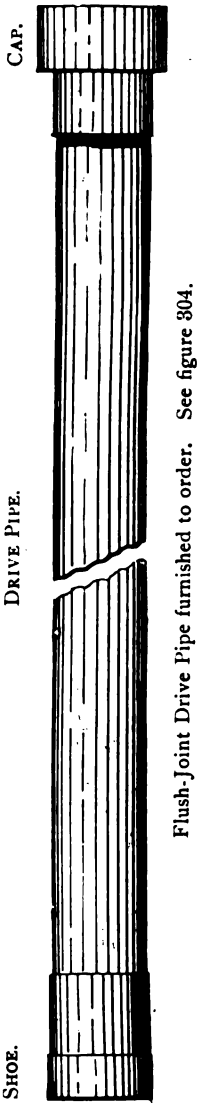


For holding up drive pipe.

DRIVE PIPE,

WITH CAP AND SHOE.

FIGURE 261.



SIZES OF DRIVE PIPE.

3-Inch.
4 "
5 "
5 5/8 "
6 "
7 "
8 "
9 "
10 "
12 "

DRIVE PIPE CAP OR HEAD.

FIGURE 262.

Different sizes to fit sizes of pipe.

DRIVE SHOES.

SHORT.

FIGURE 263.

To screw on pipe.

LONG.

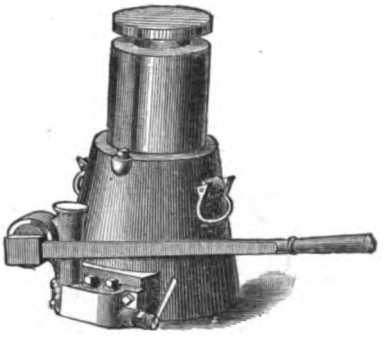
FIGURE 264.

To shrink on pipe.

Different sizes to fit any size of pipe.

LIFTING JACK.

FIGURE 267.



For pulling drive pipe.

CASING AND CASING HEADS.

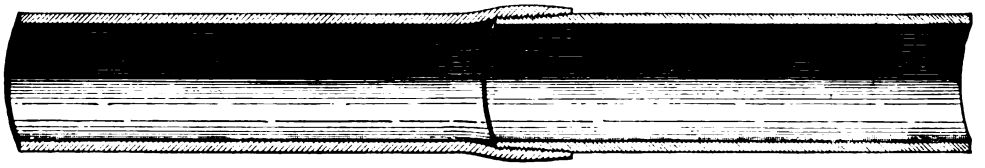
CASING.

FIGURE 275.

With Coupling. The kind commonly used.

INSERTED JOINT CASING (RARELY USED).

FIGURE 276.



SIZES OF CASING.

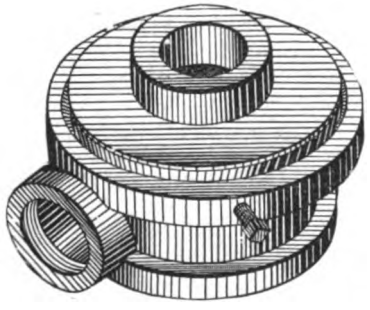
Diameter, Inside.	Diameter, Outside.	Weight Per Foot.	Diameter, Inside.	Diameter, Outside.	Weight Per Foot.	Diameter, Inside.	Diameter, Outside.	Weight Per Foot.
2	2 1/4	2.16 lbs.	3 3/4	4	5.47 lbs.	5 5/8	6	10.16 lbs.
2 1/4	2 1/2	2.75 "	4	4 1/4	5.85 "	6 1/4	6 5/8	11.15 "
2 1/2	2 3/4	3.04 "	4 1/4	4 1/2	6.17 "	6 5/8	7	11.90 "
2 3/4	3	3.33 "	4 1/2	4 3/4	6.55 "	7 5/8	8	13.65 "
3	3 1/4	3.96 "	4 3/4	5	7.58 "	8 1/4	8 5/8	14.60 "
3 1/4	3 1/2	4.28 "	5	5 1/4	8.00 "	8 5/8	9	16.76 "
3 1/2	3 3/4	4.60 "	5 3/16	5 1/2	8.40 "	9 5/8	10	21.00 "

Casing with the coupling joint, figure 275, is always sent unless otherwise ordered.

CASING HEADS.

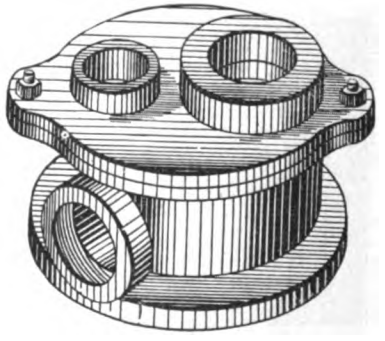
COMMON.

FIGURE 277.



TWO-HOLE.

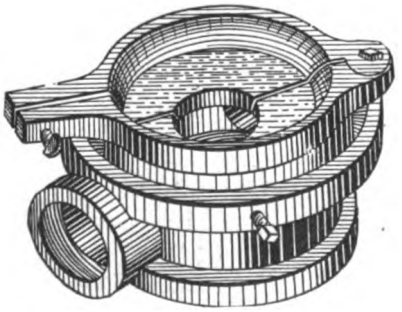
FIGURE 278.



Small hole for steam pipe.

WITH NORTHRUP'S OIL SAVER.

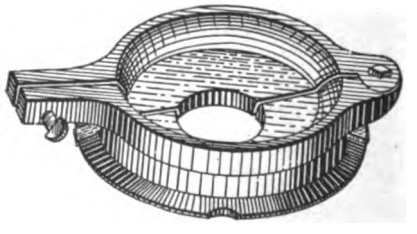
FIGURE 279.



NORTHRUP'S OIL SAVER.

EXTRA.

FIGURE 280.

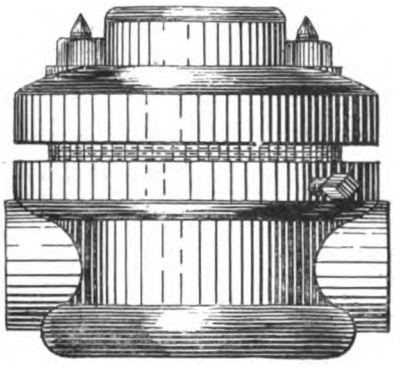


To save the oil when drilling in the oil sand and the well is flowing, or while tubing the well when it is flowing. The rubber disk encircles the cable, or the tubing, tightly, and the oil runs through the pipes in the sides of the casing head and is conducted to the oil tank.

CASING HEAD, ELEVATORS AND TONGS.

ARMOR CASING HEAD.

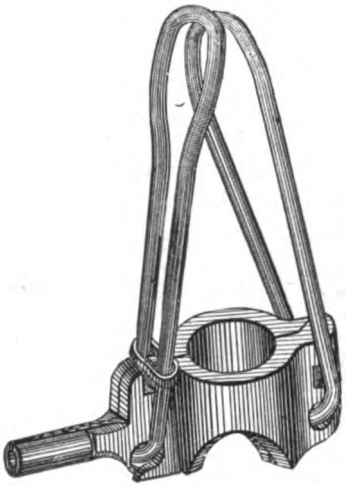
FIGURE 281.



For same purpose as the Northrup Oil Saver Casing Head.

CASING ELEVATOR.

FIGURE 282.

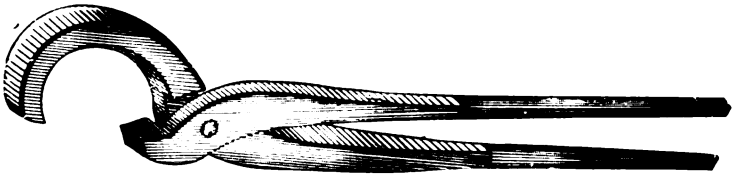


FISHER'S PATENT.

CASING TONGS.

COMMON.

FIGURE 283

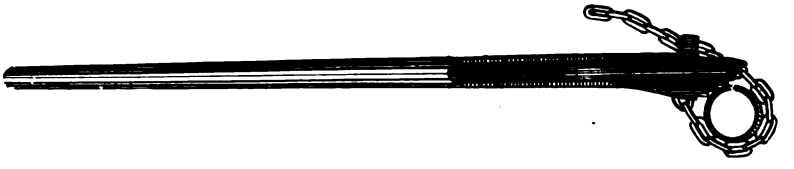


LAY'S PATENT.

FIGURE 284.

CHAIN TONGS.

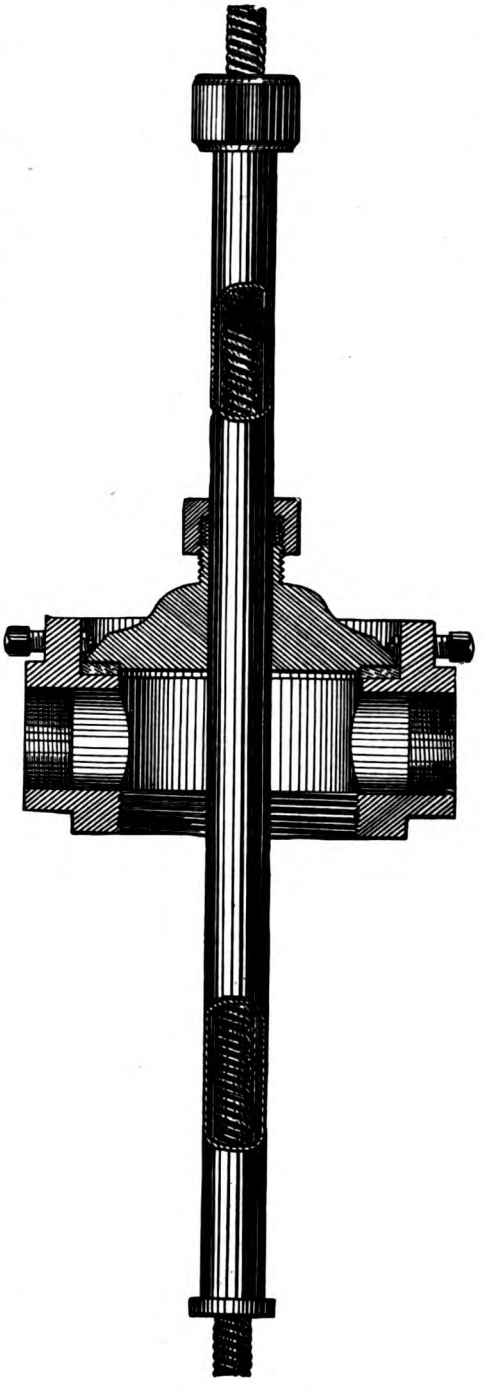
FIGURE 285.



CASING HEAD, TESTER, &c.

BARREL OIL SAVER.

FIGURE 286.



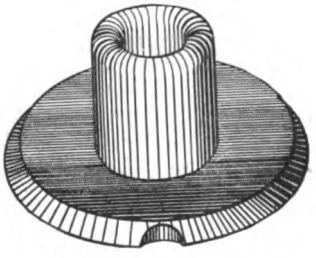
For drilling in the oil sand while the well is flowing. The drilling cable is put through the tube and fastened in by tying loose rope around it. The tube works up and down on the cable through a cap in the casing head. The oil is carried off through the pipes in the sides of the casing head.

The cap is held in the head by the set screws.

PATENTED.

SAND LINE CAP.

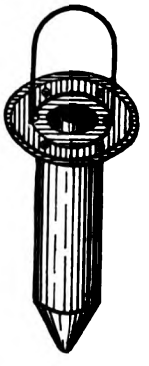
FIGURE 287.



Set in the casing head. The sand pump line is put through it. Used while the well is flowing.

CASING TESTER.

FIGURE 288.



Put below the casing, and left a few hours, to test if the casing is tight and that no water leaks through.

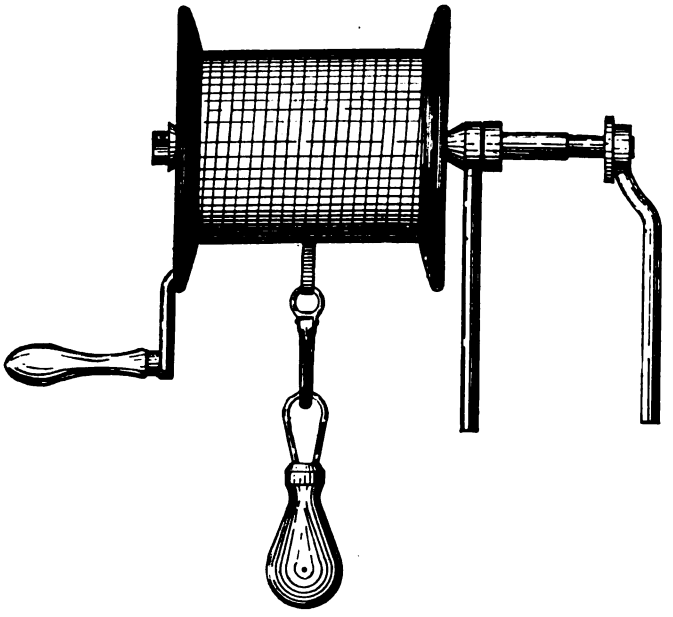
(See page 17.)

MEASURING LINES AND REELS.

(See Page 17.)

McCLURE'S PATENT MEASURING REEL.

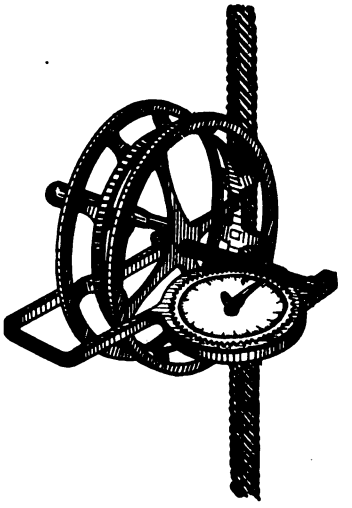
FIGURE 290.



SELF-REGISTERING MEASURING LINE.

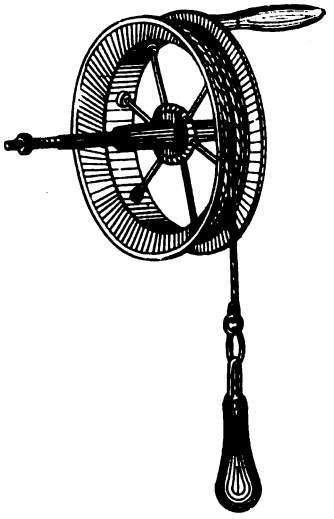
Barse Patent.

FIGURE 291.



ROUND WIRE MEASURING LINE.

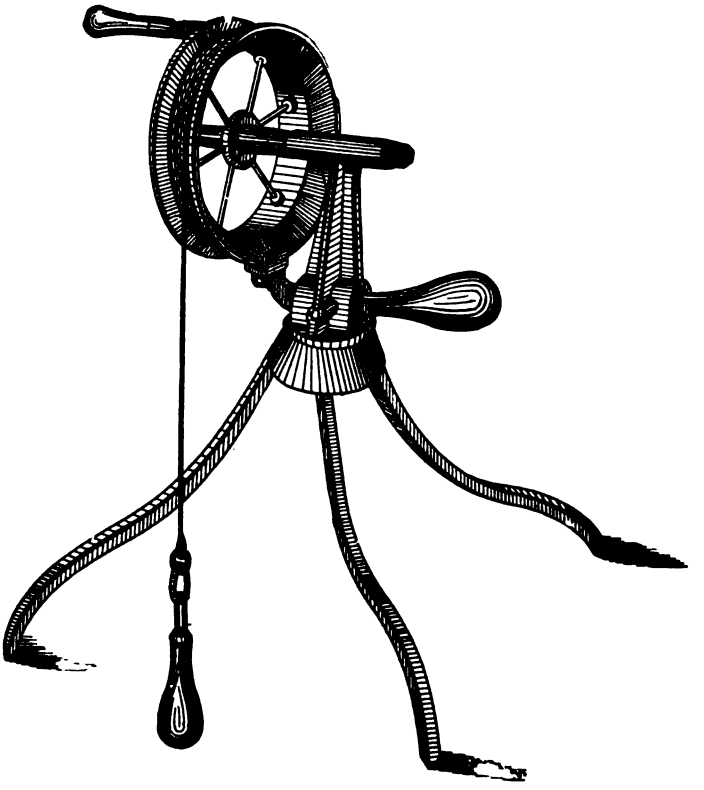
FIGURE 292.



ROUND WIRE MEASURING LINE.

On Stand, with Brake.

FIGURE 293.

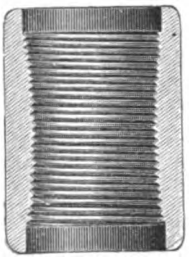


To measure the depth of the well before tubing it.

TUBING.

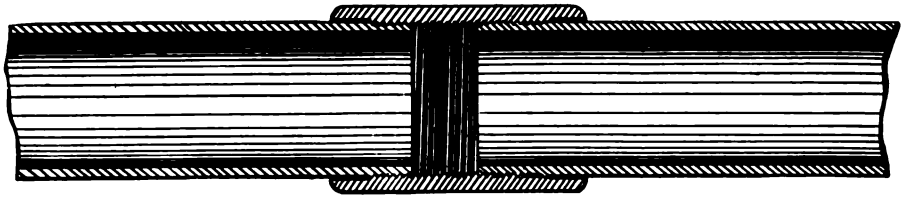
COUPLING.

FIGURE 300.



WITH SLEEVE COUPLING.

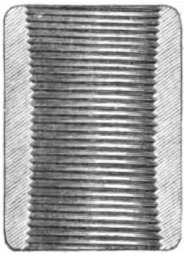
FIGURE 301.



The sleeve protects the threads and binds on the tubing, making a stronger joint. It guides the tubing into the coupling and prevents "cross-threading."

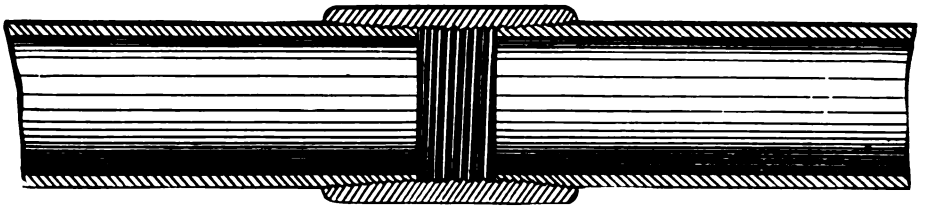
COMMON COUPLING.

FIGURE 302.



TUBING WITH COMMON COUPLING.

FIGURE 303.



FLUSH-JOINT TUBING OR DRIVE PIPE.

FIGURE 304.

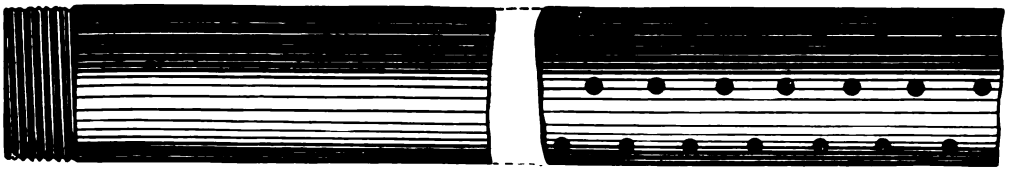
The ends of the tube are turned out and a thread cut on—no couplings used—flush outside.

Furnished only to order.

SIZES OF TUBING MADE: 1, 1¼, 1½, 2, 2½, 3, 3½, 4, 5, 6, 7, 8, 9, 10, 12-inch.

PERFORATED PIPE OR ANCHOR.

FIGURE 305.



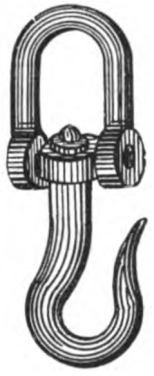
Used in the bottom of the well (see page 17, and figures 27 and 28).

TUBING HOOKS, ELEVATORS, &c.

TUBING HOOKS.

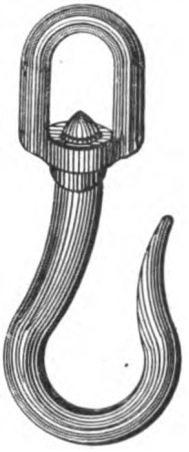
DOUBLE SWIVEL.

FIGURE 310.



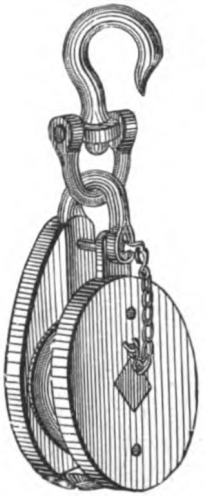
COMMON.

FIGURE 311.



SNATCH BLOCK.

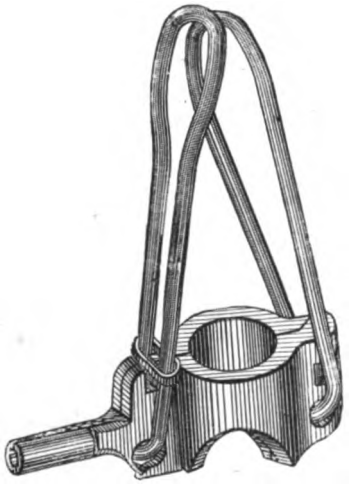
FIGURE 312.



ELEVATORS.

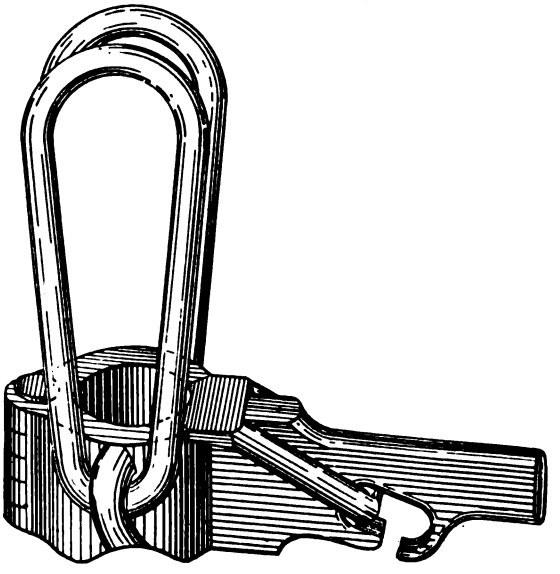
FISHER'S PATENT.

FIGURE 313



FAIR'S PATENT.

FIGURE 314.



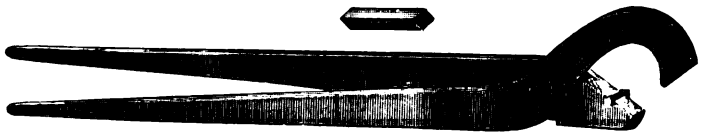
SIZES OF ELEVATORS.

1, 1¼, 1½, 2, 2½, 3, 3¼, 4, 4¼, 5, 5⅝, 6, 6¼, 7, 8-inch.

TUBING TONGS, BAILERS, &c.

LAY'S PATENT TONGS (see page 17).

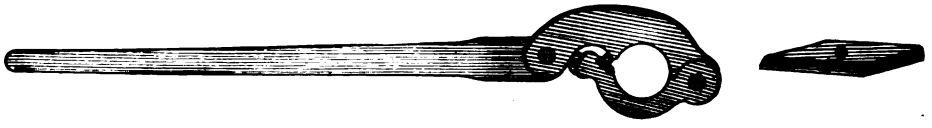
FIGURE 315.



For all sizes of tubing.

CRUMBIE'S PATENT TONGS.

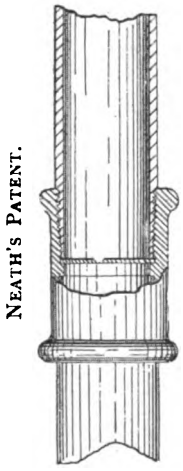
FIGURE 316.



For 2-inch tubing and under.

TUBING DISK.

FIGURE 318.



To prevent a well from flowing while being tubed.

The disk is put in the tubing, above the anchor (see figure 28). When the operation of tubing is completed, the disk, which is of a brittle metal, is broken by dropping a weight in the tubing and the well is then permitted to flow.

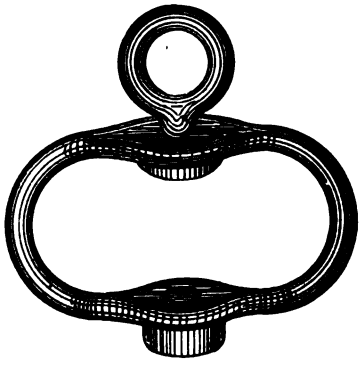
TUBING BAILER.

FIGURE 317.

To bail the water out of tubing.

SUCKER ROD SWIVEL.

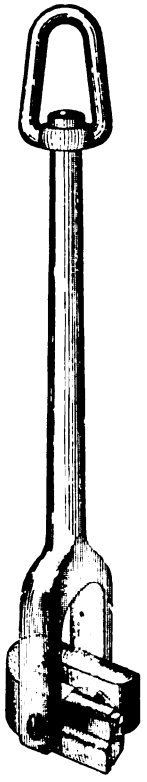
FIGURE 319.



Used in putting sucker rods in a well.

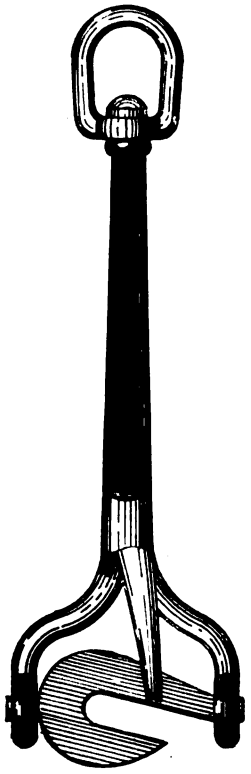
SUCKER RODS AND TOOLS FOR SAME.

SUCKER ROD ELEVATOR.
JESSOP'S PATENT.
FIGURE 320.



SUCKER ROD JOINT.
FIGURE 321.

SUCKER ROD ELEVATOR.
D. S. & Co.'s.
FIGURE 326.



SUCKER ROD HOOK.
FIGURE 327.

SUCKER RODS.

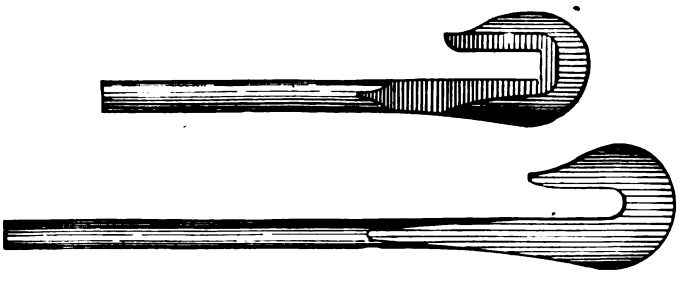
FIGURE 322. WOODEN SUCKER ROD FOR 2-INCH TUBING.

FIGURE 323. WOODEN SUCKER ROD FOR LARGE TUBING.

FIGURE 324. ROUND IRON OR STEEL SUCKER ROD FOR SMALL TUBING.

FIGURE 325. TWISTED IRON SUCKER ROD FOR SMALL TUBING.

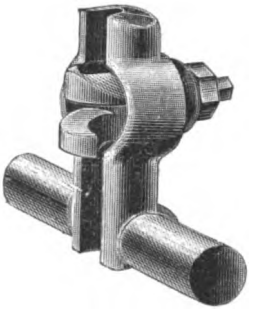
SUCKER ROD WRENCHES.—A PAIR.
FIGURE 328.



FOR PUMPING WELLS.

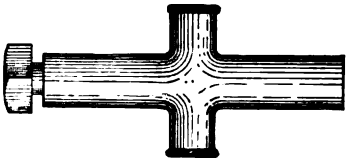
ADJUSTERS.

LEWIS PATENT.
FIGURE 340.



LOCKE PATENT.
FIGURE 341.

LITTLE GIANT.
FIGURE 342.



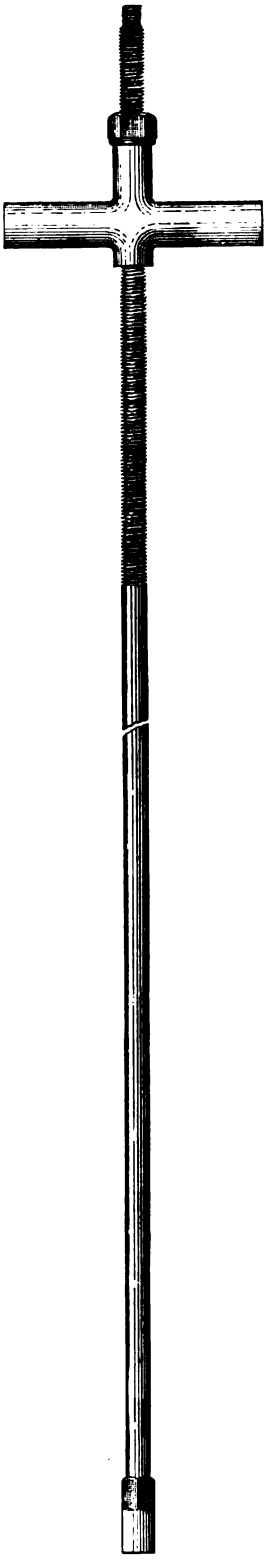
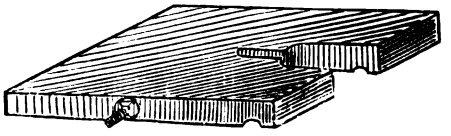
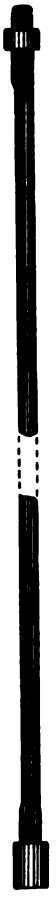


FIGURE 343. ADJUSTER, WITH SCREW. POLISHED ROD.

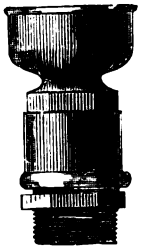
ADJUSTER BOARD.
FIGURE 345.



VALVE ROD.
FIGURE 347.



STUFFING BOX.
FIGURE 346.



ADJUSTER T BOLT.
FIGURE 348.

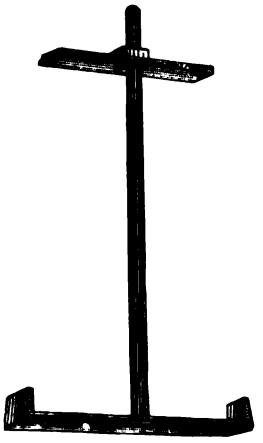


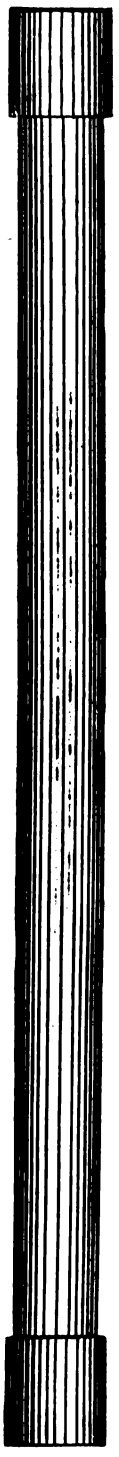
FIGURE 344. POLISHED ROD.

WORKING BARRELS OR PUMPS.

(See page 18.)

COMMON WORKING BARREL.

FIGURE 360.



Brass or cast iron, with or without valves.

WORKING BARREL, WITH VALVES.

FIGURE 361.

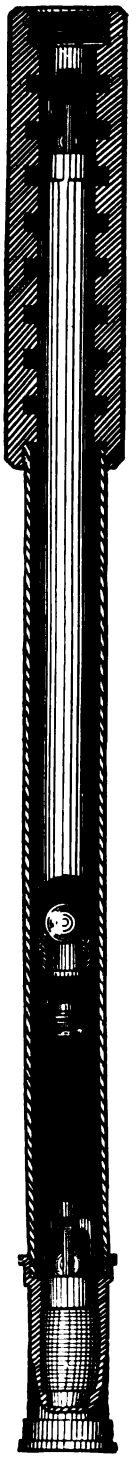
SNOW'S PATENT WORKING BARREL.

FIGURE 362.

With valves complete.

SECTION OF SNOW WORKING BARREL.

FIGURE 363.



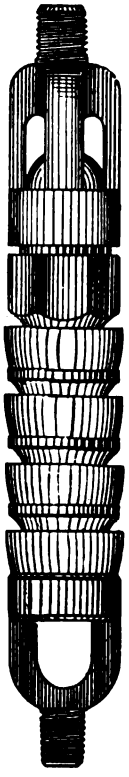
LIQUID PACKING.

PLUNGER WORKING BARREL. FIGURE 364. Plunger plain or corrugated.

WORKING BARREL, OR PUMP VALVES.

COMMON
UPPER VALVE.

FIGURE 375.



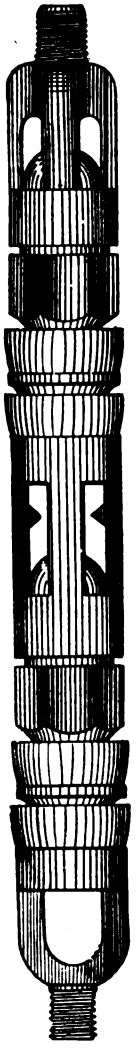
LOWER VALVE.

FIGURE 379.

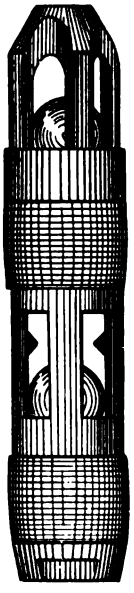
VALVE CUP.

FIGURE 383.

DOUBLE BALL UPPER VALVE. FIGURE 376.



DOUBLE LOWER VALVE. FIGURE 380.



ROPE
WORKING VALVE.

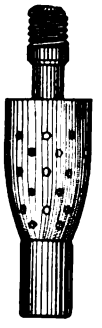
FIGURE 377.

STEEL SEAT FOR
VALVES.

FIGURE 381.

RIVET CATCHER.

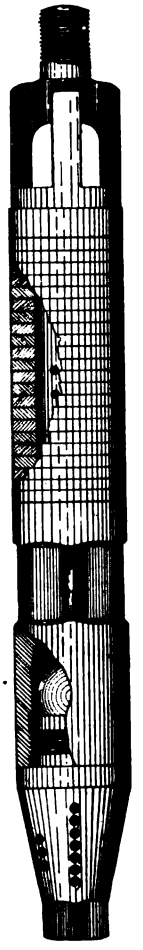
FIGURE 384.



To put above working valve to catch any rivets that may drop out of the sucker rods.

LEWIS PATENT
WORKING VALVE.

FIGURE 378.

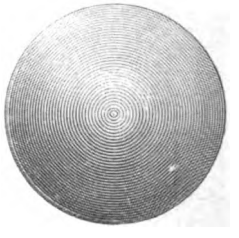


BOTTOM OF
LEWIS VALVE,
WITH STRAINER OFF.

FIGURE 382.

VALVE BALL.

FIGURE 385.



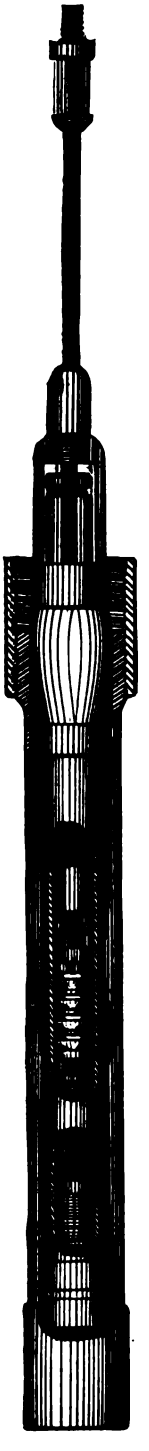
WORKING BARREL VALVES, &c.

(See page 18).

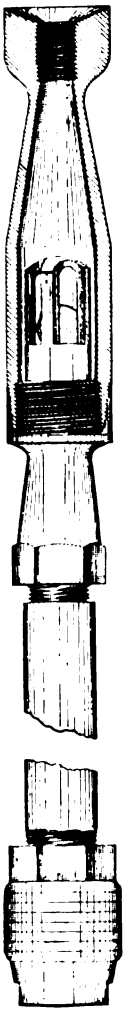
KINNEY
GAS VALVE.
FIGURE 386.

CROCKER
CHECK VALVE.
FIGURE 387.

SHOWING
CROCKER
CHECK VALVE
SEATED, WITH VALVES
BELOW.
FIGURE 388.

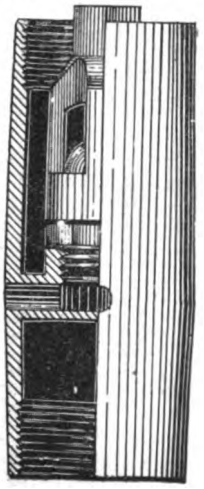


SPENCER
JET.
FIGURE 389.

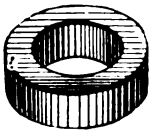


To make a well flow that has only a small quantity of gas.

FLEMING
GAS VALVE.
FIGURE 390.



STEEL SEAT
FOR
CROCKER VALVE.
FIGURE 391.

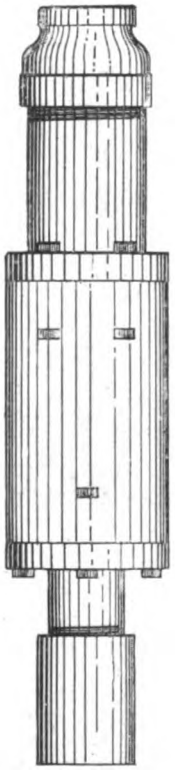


WATER PACKERS.

(See page 18.)

HOADLEY PACKER.

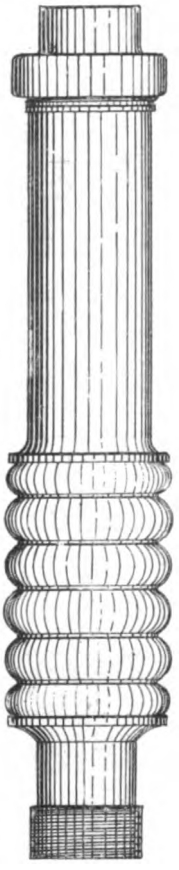
FIGURE 400.



EATON PACKER.

SHORT RUBBER.

FIGURE 401.

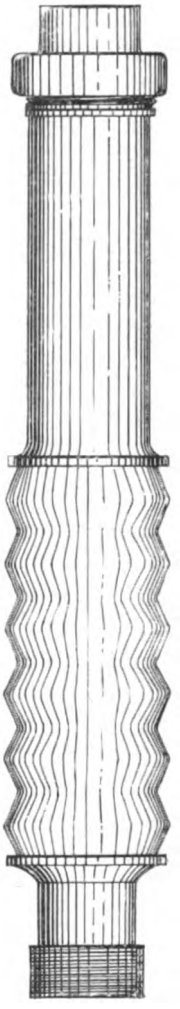


(See figure 28.)

EATON PACKER.

LONG RUBBER.

FIGURE 402.



ARMOR PACKER.

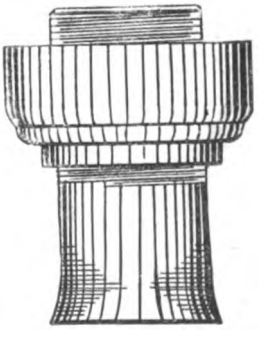
FIGURE 403.

TUBING PACKER.

FIGURE 404.

HEINZ CUP PACKER.

FIGURE 405.

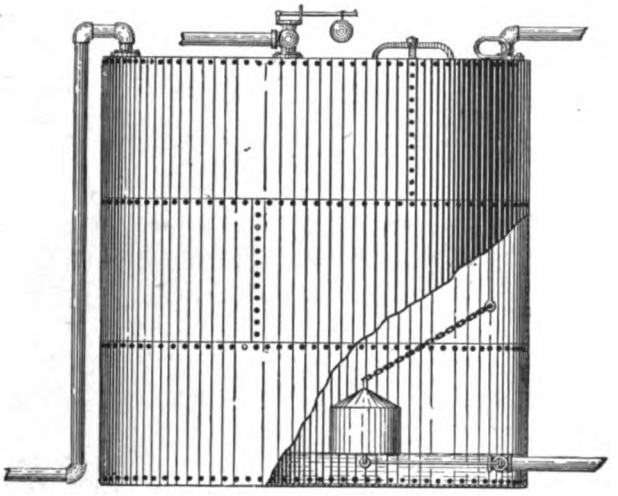


TANKS, &c.

IRON GAS TANKS.

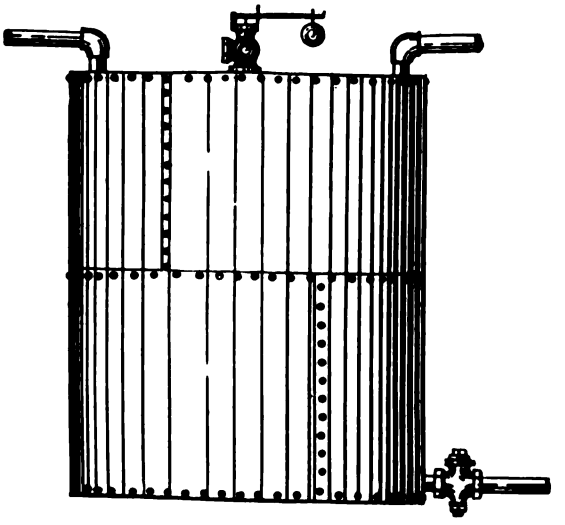
ASHTON'S PATENT.

FIGURE 410.



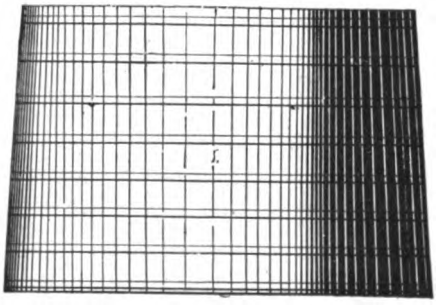
COMMON.

FIGURE 411.



WOODEN TANK.

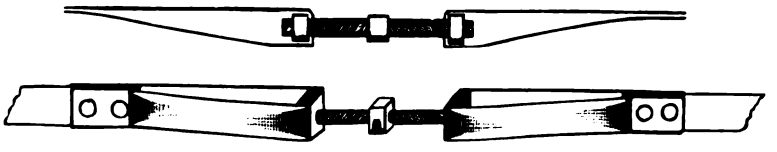
FIGURE 412.



Any size from 20 barrels to 1,200 barrels' capacity.

WARE'S PATENT TANK HOOP CONNECTION.

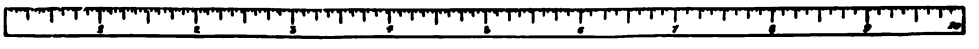
FIGURE 413.



To tighten the hoop when desired.

GAUGE ROD.

FIGURE 414.



CONNECTING RODS, &c.

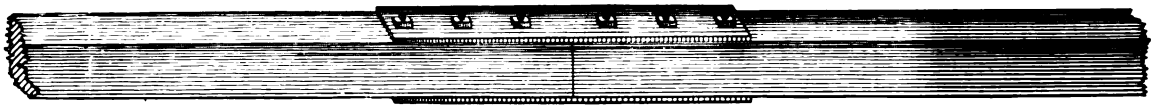
WOODEN CONNECTING RODS.

SMALL SIZE.—1¾ x 2½ Inches.

FIGURE 415.

LARGE SIZE.—2 x 3 Inches.

FIGURE 416.



ANY OTHER SIZES MADE TO ORDER.

These rods are used to connect several wells, so that they can all be pumped by one engine. A hundred different wells may be thus coupled together, even though thousands of feet apart. The manner of making connections is shown in figure 448, *et seq.*, on page 144, *et seq.*

The rods are of ash, from 20 to 25 feet long, and are united by fish plates, fastened to the rods by bolts and nuts.

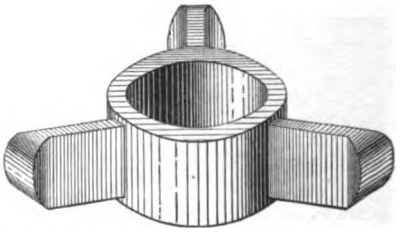
WATER WELL HOOK.

FIGURE 418.

TUBING STAY.

CORBETT'S.

FIGURE 419.



TUBING STAY.

ARNOLD'S.

FIGURE 420.

ROPE CLAMPS.

CORBETT'S.

FIGURE 421.

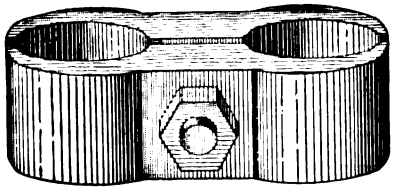
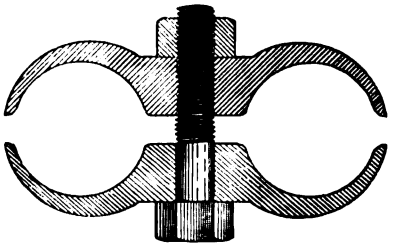


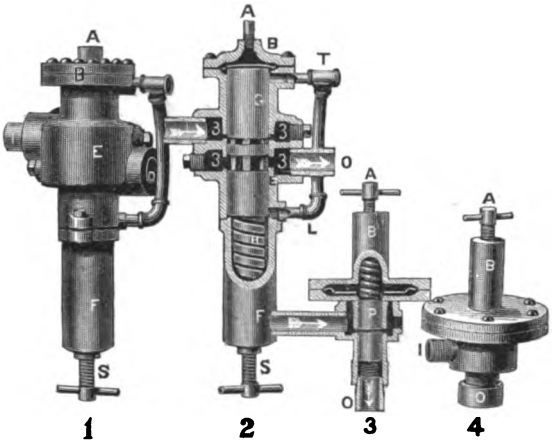
FIGURE 422.



GAS REGULATORS, OIL BURNER, &c.

LUTHER'S
PATENT GAS REGULATOR.

FIGURE 423.



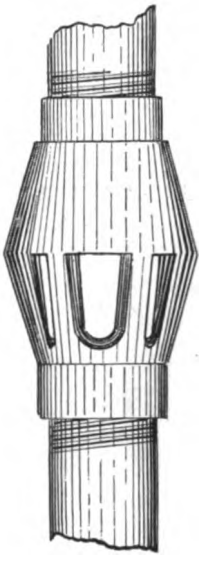
To cause gas to be delivered to a furnace at a uniform pressure.

Separate circular furnished.

WELL FLOWER.

INNISS' PATENT.

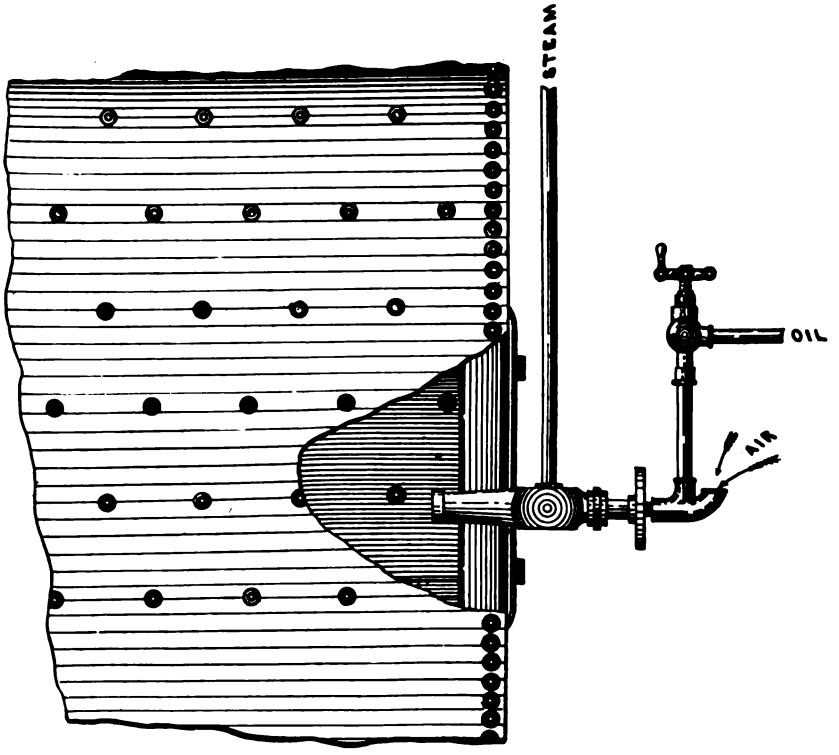
FIGURE 425.



OIL BURNER.

PARSON'S PATENT.

FIGURE 426.

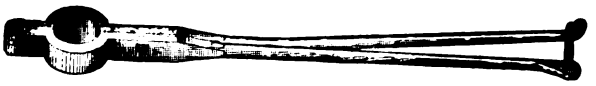


Showing how it is attached to the boiler.

MISCELLANEOUS WELL GOODS.

TUBING CLAMPS.

FIGURE 427.

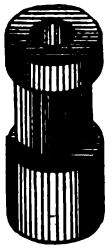


PARAFFINE AUGER.

FIGURE 428.

ELEVATOR OR POLISHED ROD SUB.

FIGURE 429.

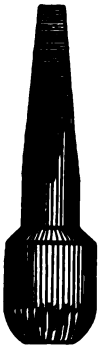


SOFT PLUG FOR BOILER.

FIGURE 430.

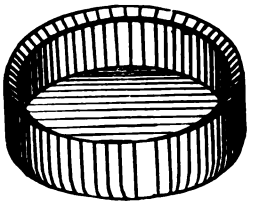
VALVE REAMER.

FIGURE 431.



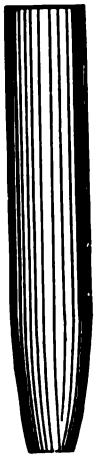
LEATHER CUP FOR CASING.

FIGURE 432.



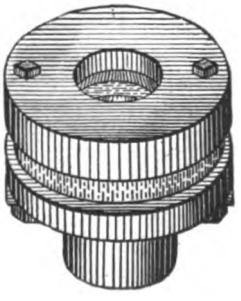
DRY HOLE PLUG.

FIGURE 434.



SUCKER ROD CLEANER.

FIGURE 433.



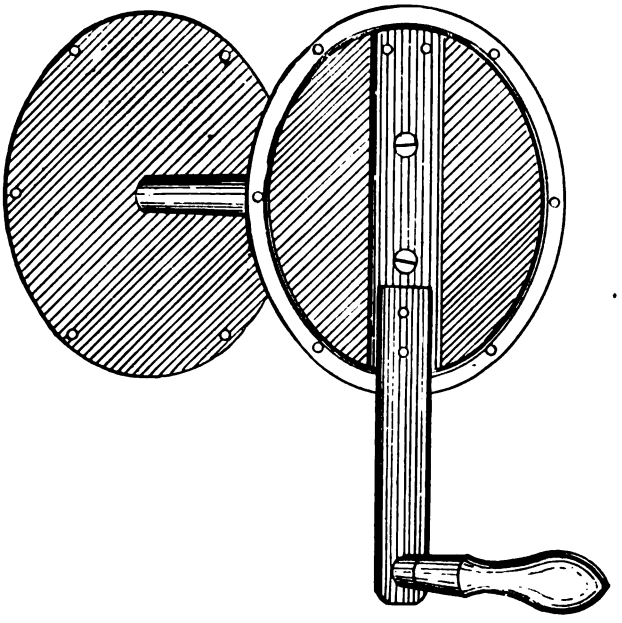
TAP FOR DRAWING LOWER VALVE.

FIGURE 435.

TORPEDO REELS.

COMMON TORPEDO REEL.

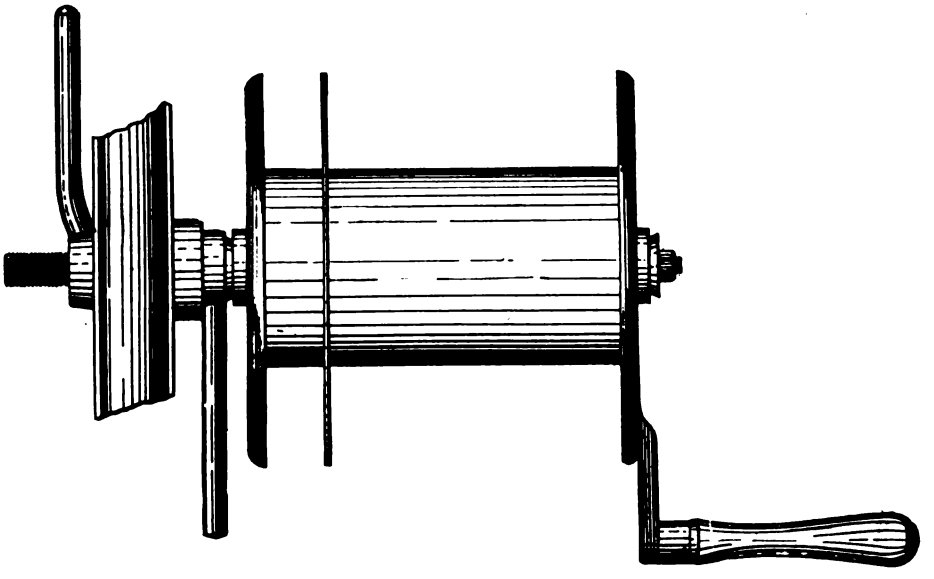
FIGURE 440.



McCLURE'S PATENT TORPEDO REEL.

With brake attachment.

FIGURE 441.



The line for lowering the torpedo is put on the wide part of the reel and a fine line for a squib on the narrow part—a squib is used when the torpedo cannot be exploded in the ordinary way.

APPARATUS TO PUMP LARGE WELLS.

TO RUN BY A BELT.

FIGURE 445.

END VIEW.

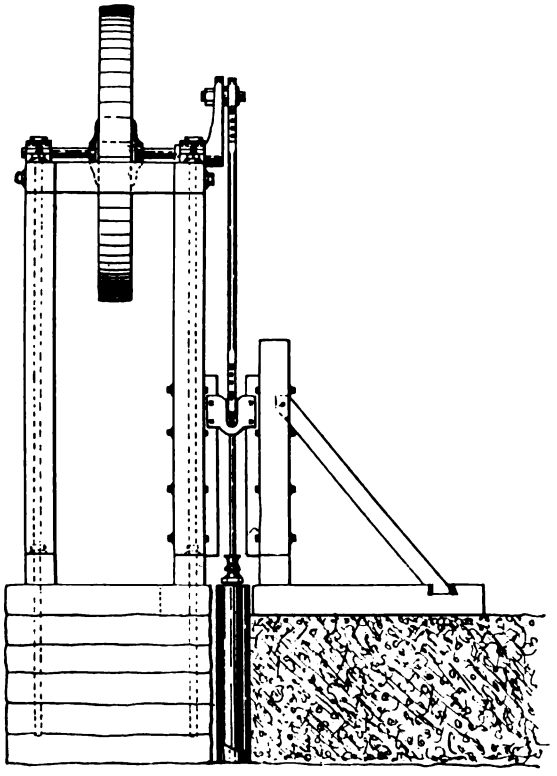
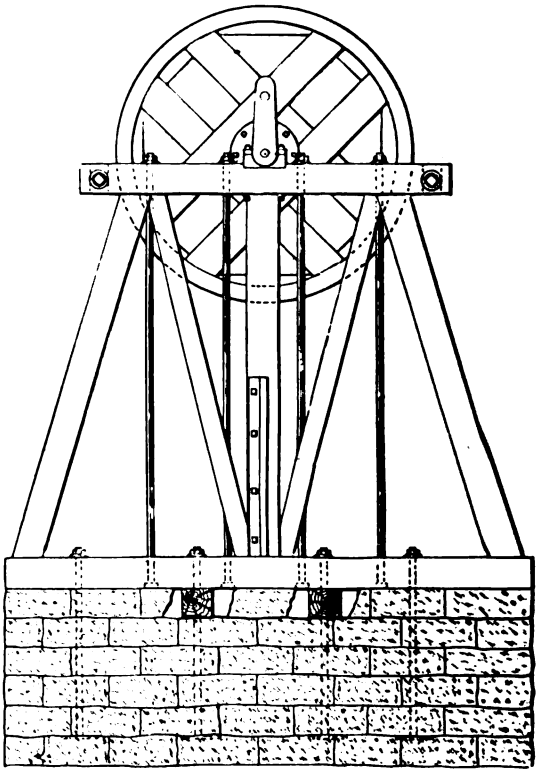


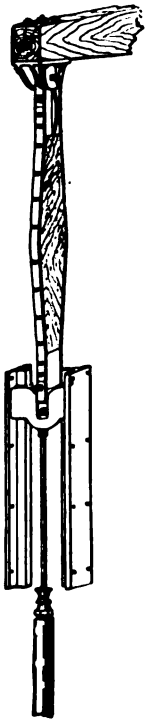
FIGURE 446.

SIDE VIEW.



TO WORK ON WALKING BEAM.

FIGURE 447.



These outfits are for large and deep wells where the pumps are run at high speeds and large quantities of water are raised.

The pump and valves do not differ essentially from the common ones, except in being extra large and heavy.

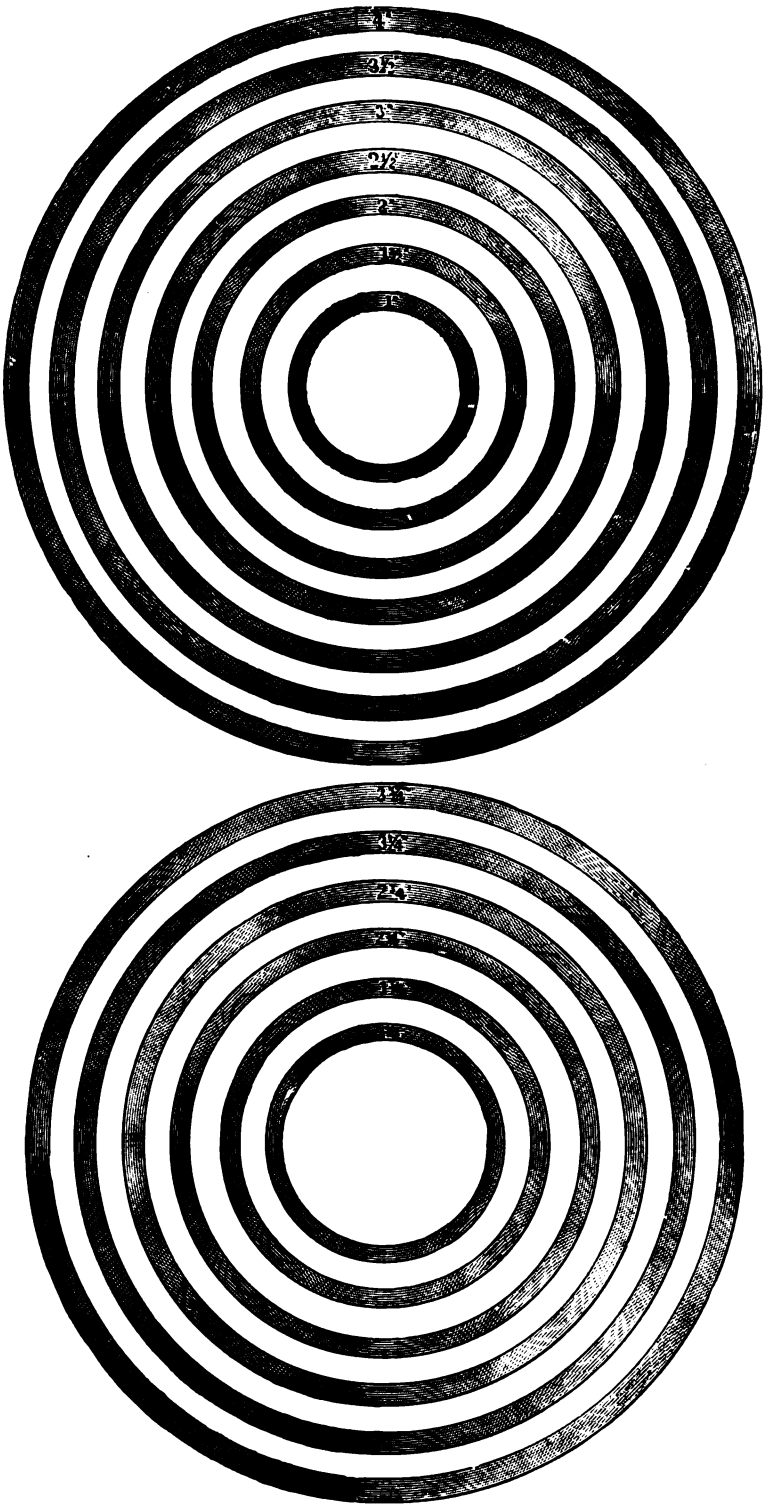
There are two different styles, one (shown in figures 445 and 446), with vertical direct-acting attachment, and the other (figure 447), where the power is transmitted by means of a walking beam. In most cases the band wheel attachment is the more desirable, especially when the pumps are over five inches in diameter.

Large numbers of these outfits are in successful operation at coal and ore mines, coke works, and railroad pump stations.

A specification of the lumber required will be furnished on application.

BOILER TUBES.

FIGURE 500.



The cut shows the inside and outside diameters of the sizes from one inch to four inches. Boiler tubes are sized by their outside diameters.

The table below shows the thickness of each size, in decimal fractions of an inch, and the nearest Birmingham Wire Gauge (B. W. G.) number to such thickness. The nominal weight per foot is also given, but this weight varies slightly.

LAP-WELDED CHARCOAL IRON BOILER TUBES.

Outside Diameter.	Thickness, Inches.	Nearest B. W. G.	Nominal W't per foot.	Outside Diameter.	Thickness, Inches.	Nearest B. W. G.	Nominal W't per foot.	Outside Diameter.	Thickness, Inches.	Nearest B. W. G.	Nominal W't per foot.
1 in.	.072	15	.70	2¾ in.	.109	12	3.04	5 in.	.148	9	7.58
1¼ "	.072	15	.90	3 "	.109	12	3.33	6 "	.165	8	10.16
1½ "	.083	14	1.24	3¼ "	.120	11	3.96	7 "	.165	8	11.90
1¾ "	.095	13	1.66	3½ "	.120	11	4.28	8 "	.165	8	13.65
2 "	.095	13	1.91	3¾ "	.120	11	4.60	9 "	.180	7	16.76
2¼ "	.095	13	2.16	4 "	.134	10	5.47	10 "	.203	6	21.00
2½ "	.109	12	2.75	4½ "	.134	10	6.17				

WROUGHT IRON PIPE.

FIGURE 501.

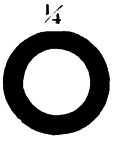
STANDARD WROUGHT IRON STEAM, GAS AND WATER PIPES.

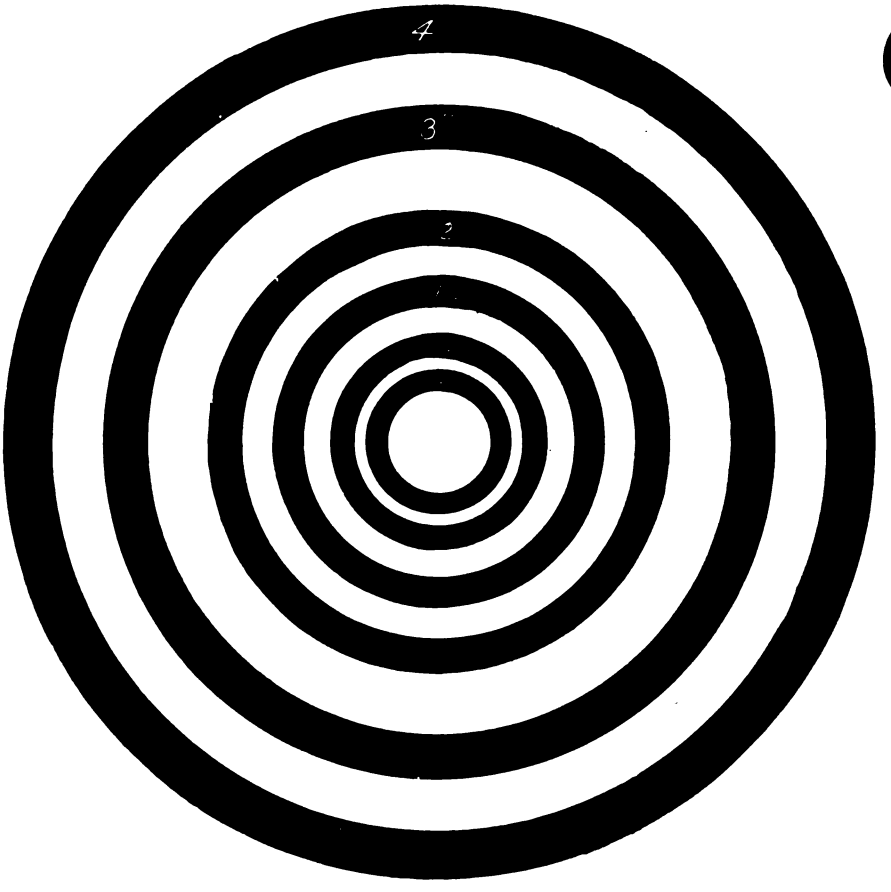
BUTT-WELDED.

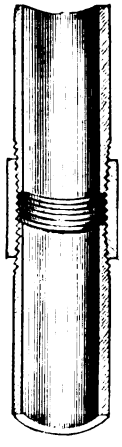
Nom. Size Inside Diameter.	Thickness.	Nominal Weight per foot.	No. Threads per inch of Screw.
INCHES.	INCHES.	POUNDS.	
1/8	.068	.24	27
1/4	.088	.42	18
3/8	.091	.56	18
1/2	.109	.84	14
3/4	.113	1.12	14
1	.134	1.67	11 1/2
1 1/4	.140	2.24	11 1/2

LAP-WELDED.

Nom. Size Inside Diameter.	Thickness.	Nominal Weight per foot.	No. Threads per inch of Screw.
INCHES.	INCHES.	POUNDS.	
1 1/2	.145	2.68	11 1/2
2	.154	3.61	11 1/2
2 1/2	204	5.74	8
3	.217	7.54	8
3 1/2	.226	9.00	8
4	.237	10.66	8
4 1/2	.246	12.34	8
5	.259	14.50	8
6	.280	18.76	8
7	301	23.27	8
8	.322	28.18	8
9	.344	33.70	8
10	.366	40.06	8
11	.375	45.02	8
12	.375	49.00	8





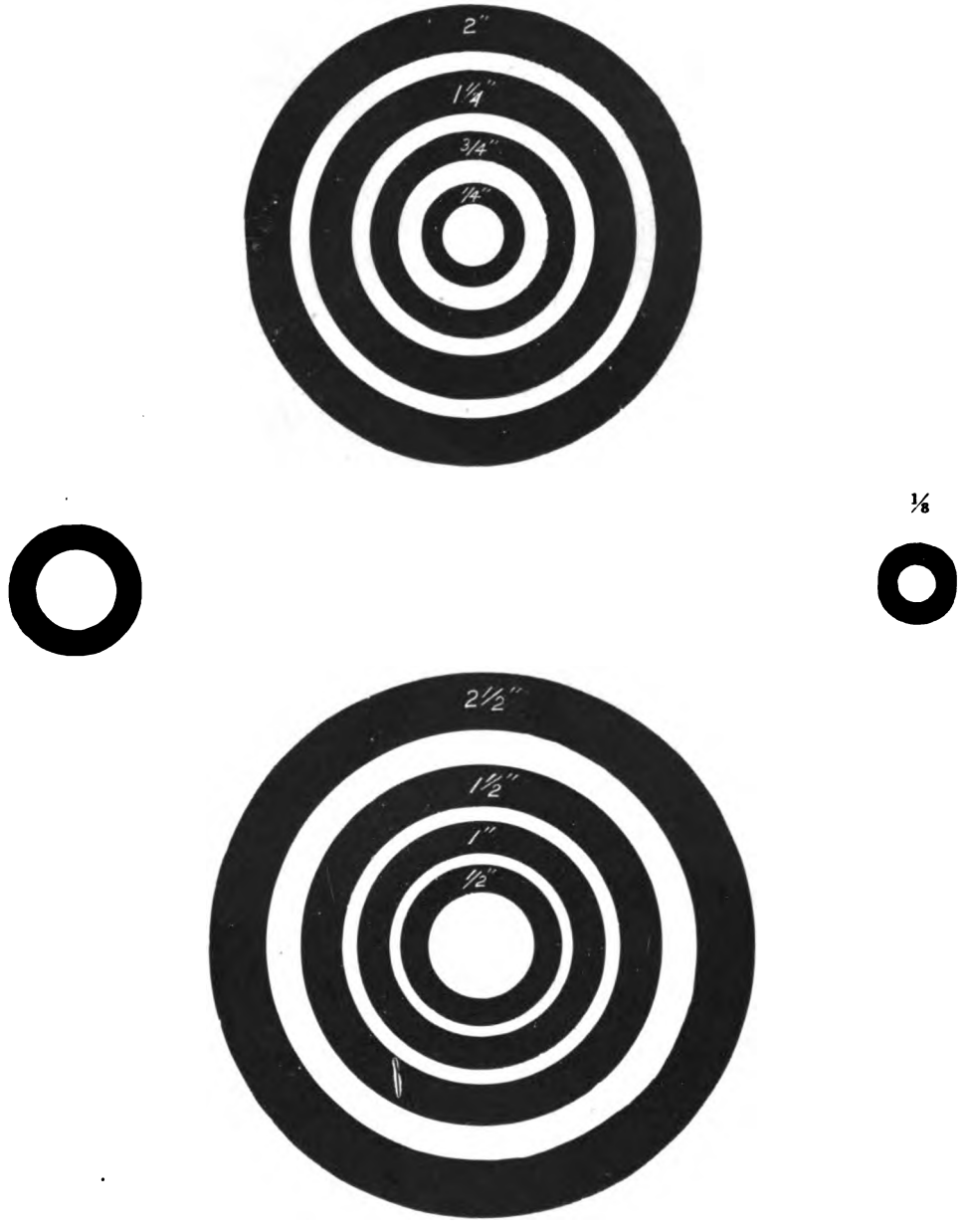


Section of Pipe with Coupling.

Showing the inside and outside diameter.

EXTRA STRONG PIPE.

FIGURE 503.



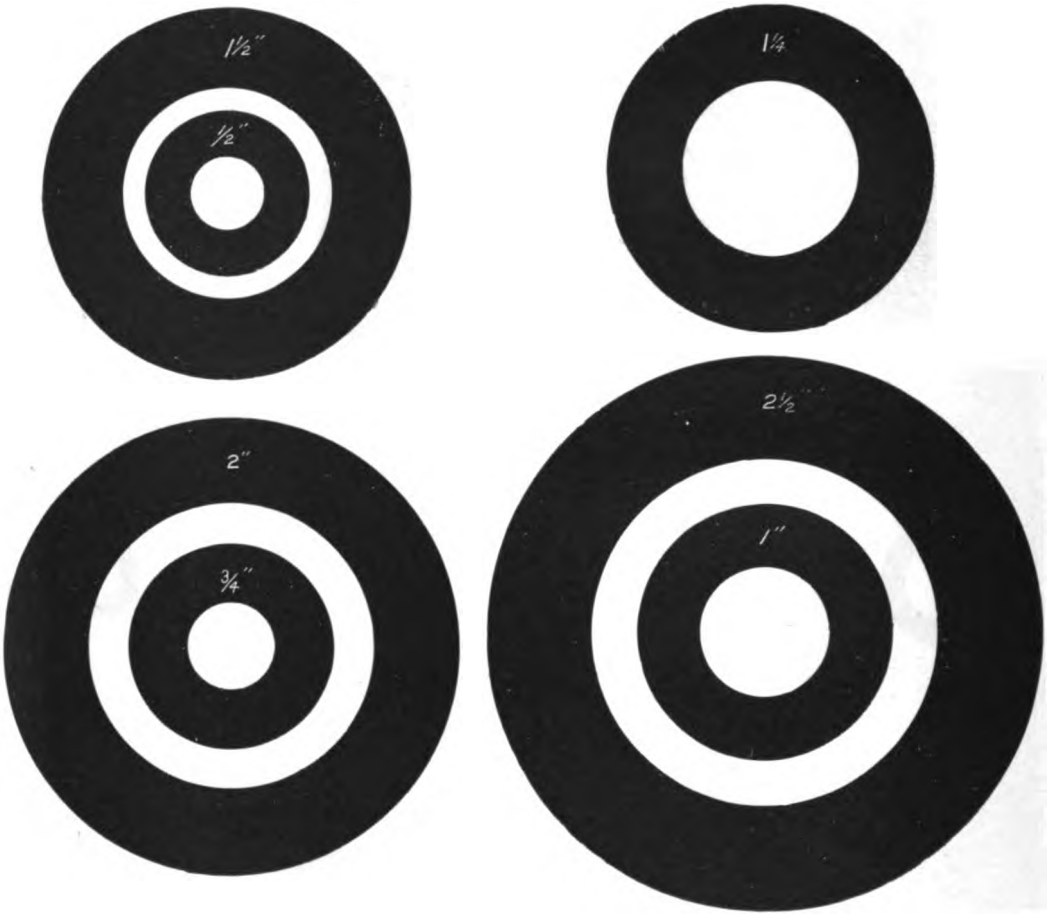
Showing the inside and outside diame ers.

EXTRA STRONG.

BUTT-WELDED.					LAP-WELDED.				
Size.	Actual Outside Diameter.	Nominal Inside Diameter.	Thickness.	Nominal Weight per foot.	Size.	Actual Outside Diameter	Nominal Inside Diameter.	Thickness.	Nominal Weight per foot.
Inches.	Inches.	Inches.	Inches.	Pounds.	Inches.	Inches.	Inches.	Inches.	Pounds.
⅛	.405	.205	.100	.29	1½	1.900	1.494	.203	3 63
¼	.540	.294	.123	.54	2	2.375	1.933	.221	5.02
⅜	.675	.421	.127	.74	2½	2 875	2.315	280	7.67
½	.840	.542	.149	1.09	3	3.500	2.892	.304	10.25
¾	1.050	.736	.157	1.39	3½	4.000	3.358	.321	12.47
1	1.315	.951	.182	2.17	4	4.500	3.818	.341	14.97
1¼	1.660	1.272	.194	3 00	5	5.563	4.813	.375	20.54
					6	6.625	5.750	.437	28.58

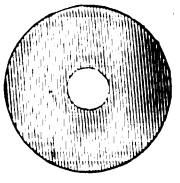
DOUBLE EXTRA STRONG PIPE.

FIGURE 504.



Showing inside and outside diameter.

HYDRAULIC PIPE.

FIGURE 504½  TO ORDER.

DOUBLE-EXTRA STRONG PIPE.

BUTT-WELDED.

Size.	Nominal Inside Diameter.	Thickness.	Nominal Weight Per Foot.
Inches.	Inches.	Inches.	Pounds.
⅛	....	....	....
¼	....	....	....
⅜	....	....	....
½	.244	.298	1.70
¾	.422	.314	2.44
1	.587	.364	3.65
1¼	.885	.388	5.20
...	....	....	....

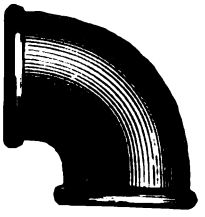
LAP-WELDED.

Size.	Nominal Inside Diameter.	Thickness.	Nominal Weight Per Foot.
Inches.	Inches.	Inches.	Pounds.
1½	1.088	.406	6.40
2	1.491	.442	9.02
2½	1.755	.560	13.68
3	2.284	.608	18.56
3½	2.716	.642	22.75
4	3.136	.682	27.48
5	4.063	.750	38.12
6	4.875	.875	53.11

FITTINGS.

ELBOW.

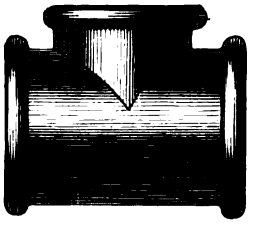
FIGURE 505.



Malleable.

TEE.

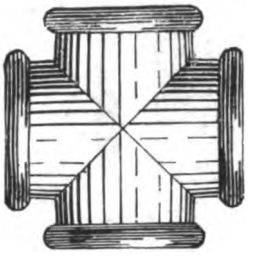
FIGURE 506.



Malleable.

CROSS.

FIGURE 507.



Malleable.

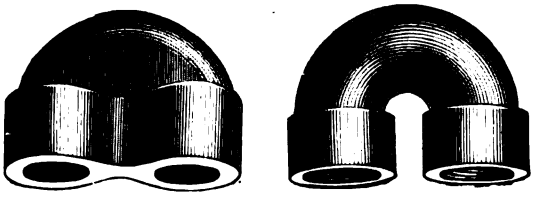
45° ELBOW.

FIGURE 508.

Malleable.

RETURN BENDS.

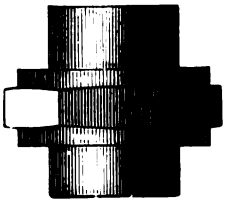
FIGURE 509.



(CLOSE.) Malleable. (OPEN.)

UNION.

FIGURE 510.

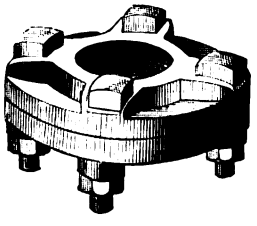


Malleable.

FLANGE UNIONS.

COMMON.—Cast Iron.

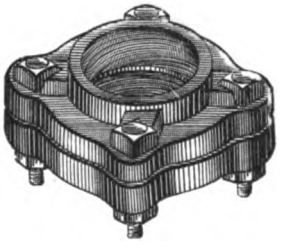
FIGURE 511.



Heavy.

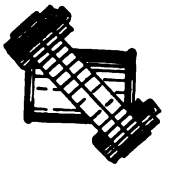
Malleable Iron.

FIGURE 512.



CUSHING'S PATENT.

FIGURE 513.



With this, two pipes can be united so as to form a straight line, or any angle up to a right angle.

BUSHING.

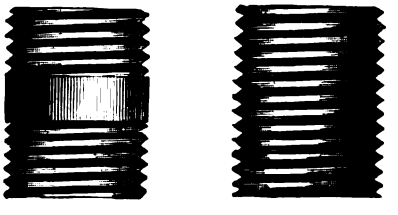
FIGURE 514.

PLUG.

FIGURE 515.

NIPPLES.

FIGURE 516.

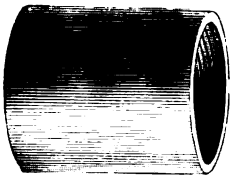


Shoulder. Close.

FITTINGS.

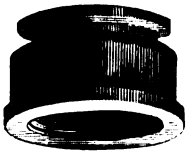
COUPLINGS AND REDUCERS.

FIGURE 517.



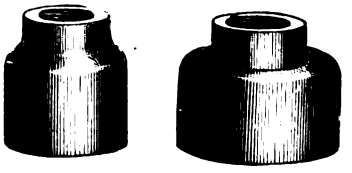
Wrought.

FIGURE 518.



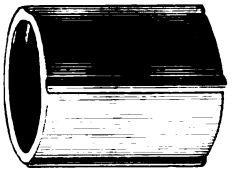
Cast Iron Reducing.

FIGURE 519.



Malleable Iron Reducing.

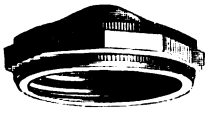
FIGURE 520.



Right and Left.

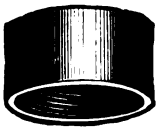
CAPS.

FIGURE 521.



Cast.

FIGURE 522.



Malleable.

LOCKNUTS.

FIG. 523.

Cast.

FIG. 524.

Malleable.

Y'S.

OLD STYLE.
FIGURE 525.

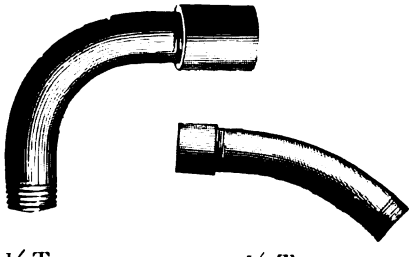
Malleable.

NEW STYLE.
FIGURE 526.

Malleable.

WROUGHT BENDS.

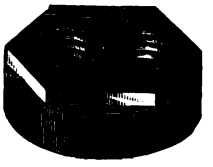
FIGURE 527.



¼ Turn. ⅛ Turn.

TWO-HOLE CAP.

FIGURE 528.



5⅝

TWO-HOLE BUSHING.

FIGURE 529.

5⅝

CAST IRON FITTINGS.

FIGURE 530.

ELBOW.

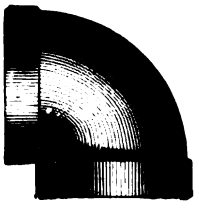


FIGURE 531.

TEE.

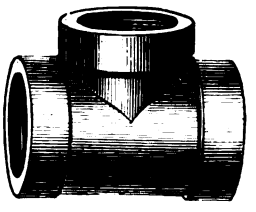
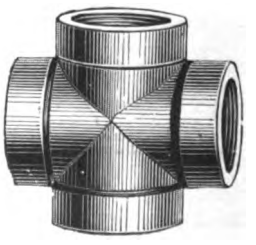


FIGURE 532.

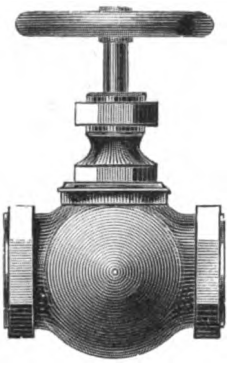
CROSS.



BRASS GOODS.

GLOBE VALVE.

FIGURE 550.



Common.

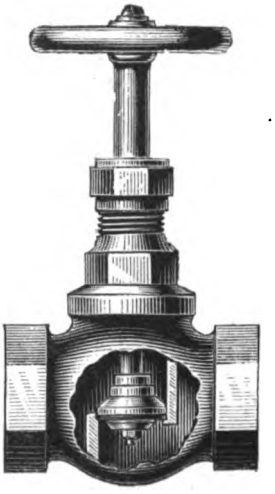
GLOBE VALVE.

FIGURE 551.

With Grooved Wheel.

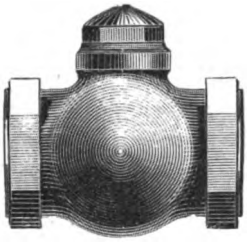
FRINK GLOBE VALVE.

FIGURE 552.



CHECK VALVES.

FIGURE 553.

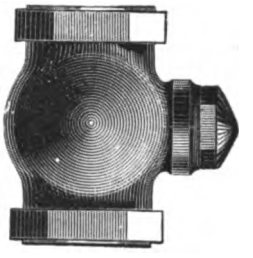


Horizontal.

FIGURE 554.

Vertical.

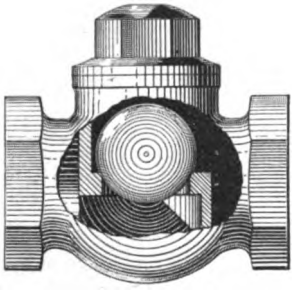
FIGURE 555.



Vertical.

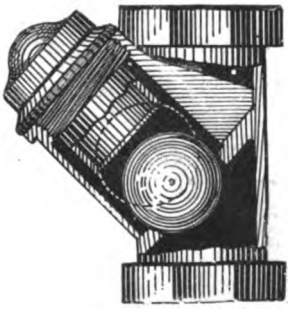
BALL CHECK VALVES.

FIGURE 556.



Horizontal.

FIGURE 557.

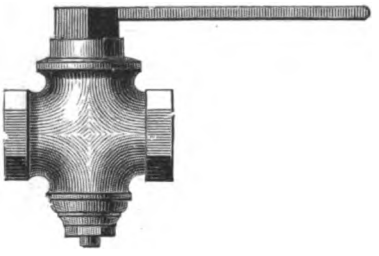


Vertical or Horizontal.

BRASS GOODS.

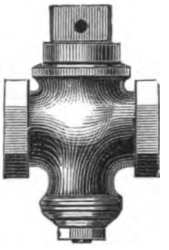
STEAM COCKS.

FIGURE 565.

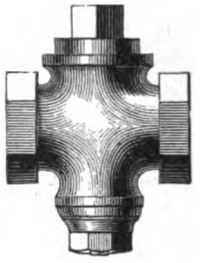


With Handle.

FIGURE 566.



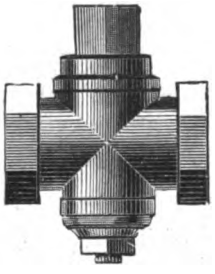
Flat Head.



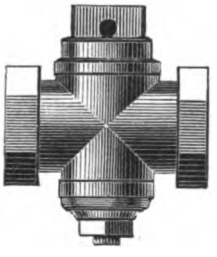
Square Head.

GAS COCKS.

FIGURE 567.

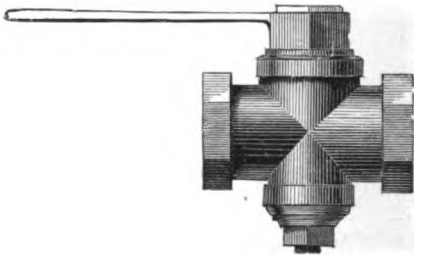


Square Head.



Flat Head.

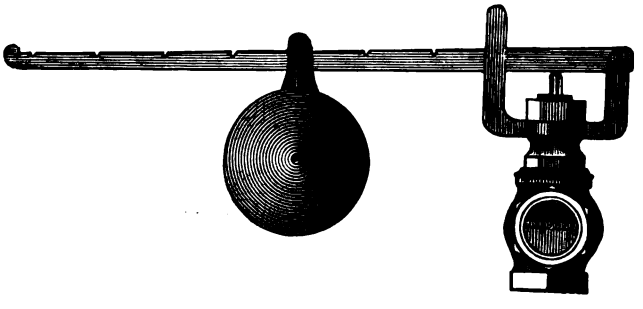
FIGURE 568.



With Handle.

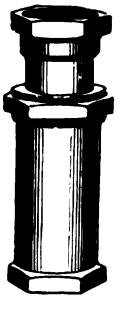
SAFETY VALVE.

FIGURE 569.



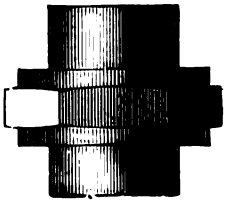
EXPANSION JOINT.

FIGURE 570.



UNION.

FIGURE 571.



BUSHING.

FIGURE 572.

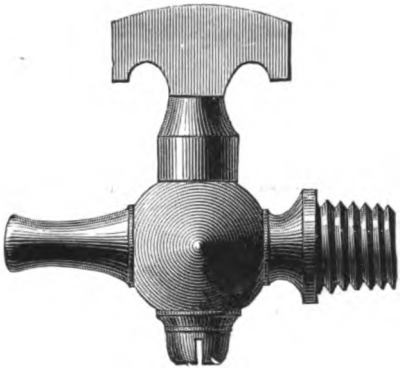
PLUG.

FIGURE 573.

BRASS GOODS.

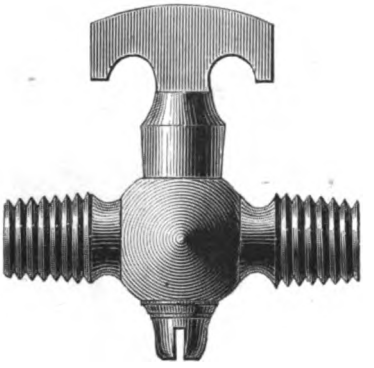
AIR COCKS.

FIGURE 580.



Single Thread. ¼ in. Full size.

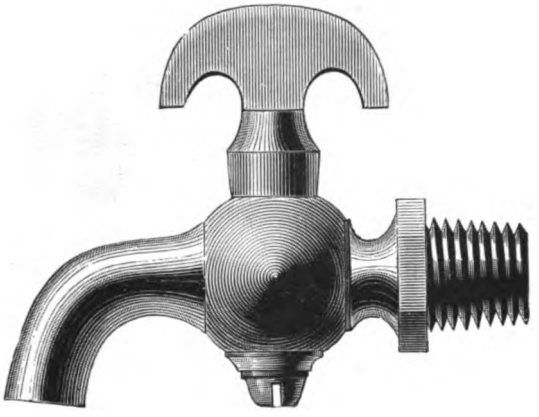
FIGURE 581.



Double Thread. ¼ in. Full size.

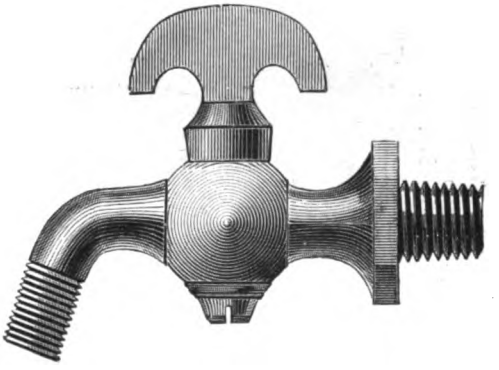
BIBB AIR COCKS.

FIGURE 583.



Single Thread. ¼ in. Full size.

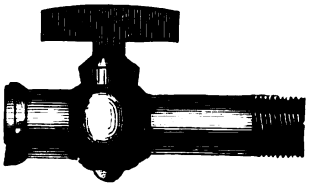
FIGURE 584.



Double Thread. ¼ in. Full size.

STEAM GAUGE COCK.

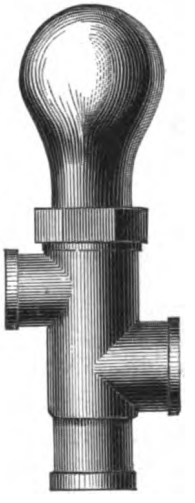
FIGURE 585.



With or without Union.

PUMP VALVE.

FIGURE 586.



BRASS GOODS.

PLAIN OIL CUPS.—Full Sizes.

FIGURE 596.
No. 5.

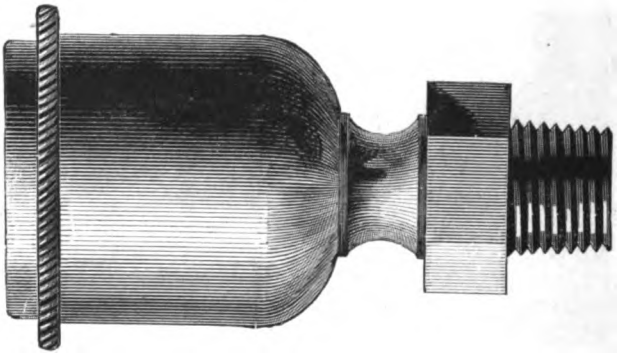


FIGURE 592.
No. 1.

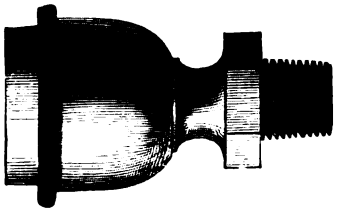


FIGURE 595.
No. 4.

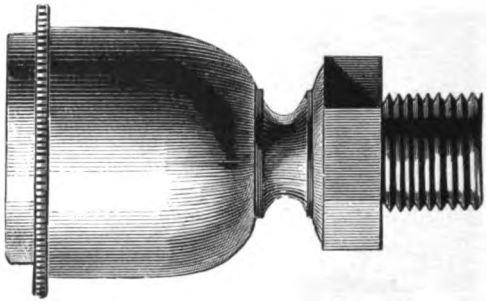


FIGURE 591.
No. 0.

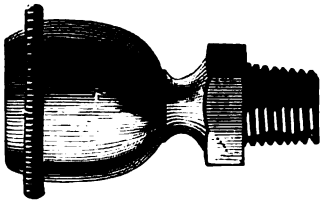


FIGURE 594.
No. 3.

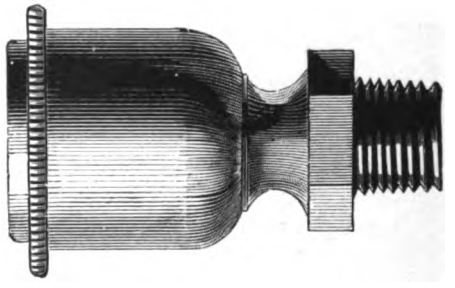


FIGURE 590.
No. 00.

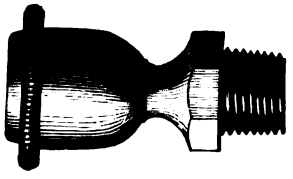
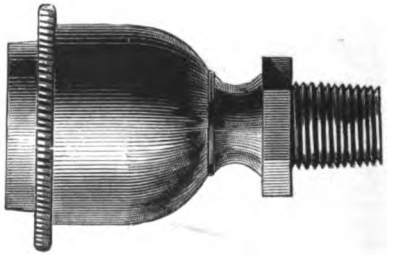


FIGURE 593.
No. 2.



BRASS GOODS.

OIL CUPS.—Full Sizes.

NEW PATTERN.

FIGURE 600.
No. 4.

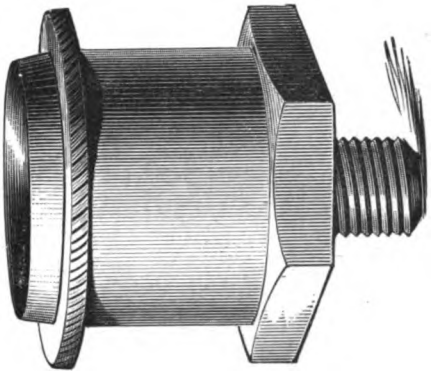


FIGURE 599.
No. 3.

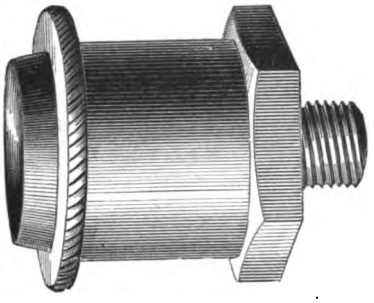


FIGURE 598.
No. 2.

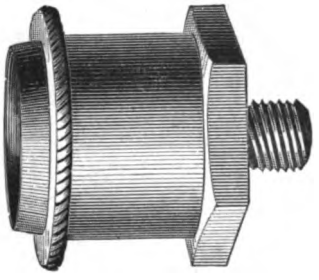
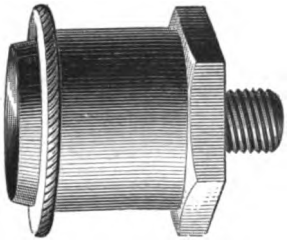


FIGURE 597.
No. 1.



LEVER HANDLE.

FIGURE 601.
No. 1.

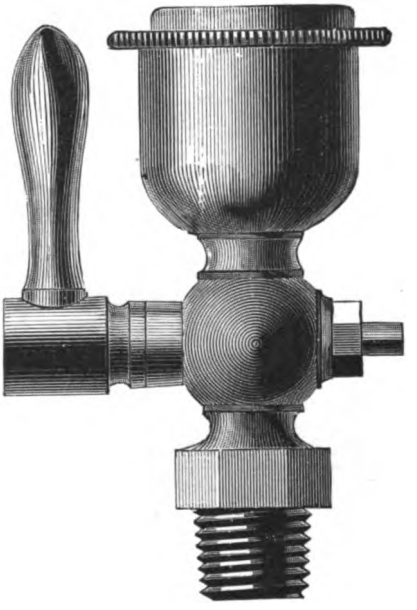


FIGURE 602.
No. 2.

BRASS GOODS.

LEVER HANDLE OIL CUPS.—Full Sizes.

FIGURE 603.

No. 3.

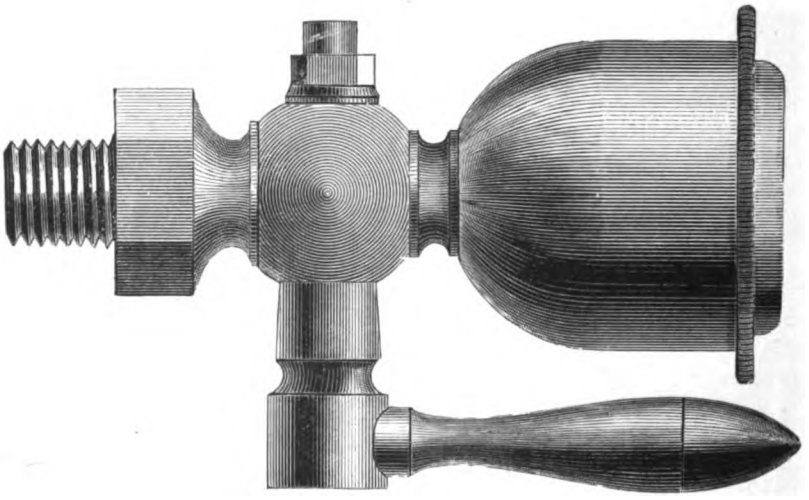
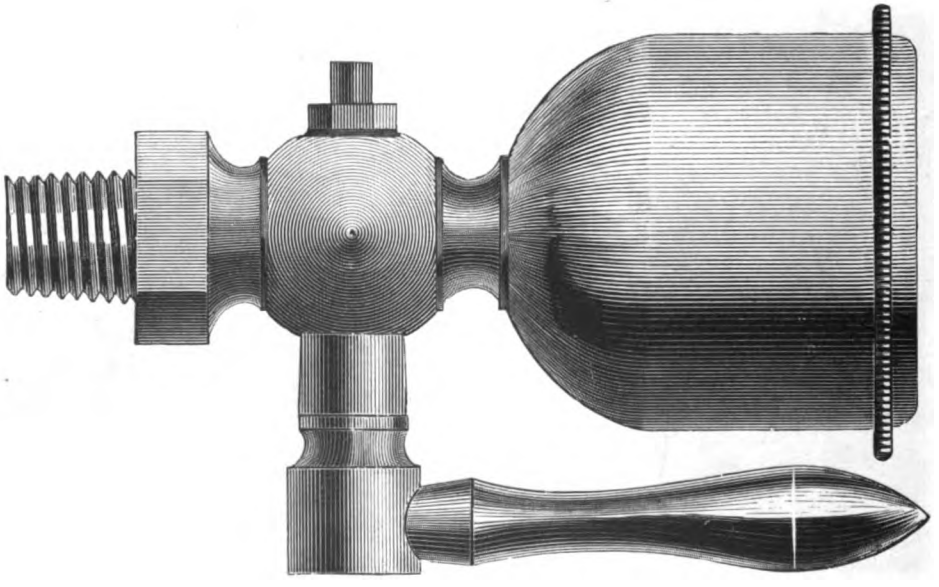


FIGURE 604.

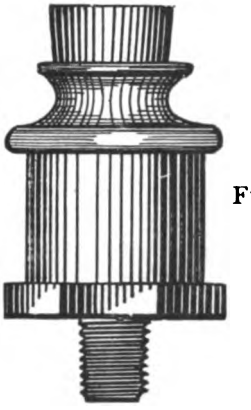
No. 4.



BRASS GOODS.

OIL CUP WITH CORK.

FIGURE 605.



No. 1. FULL SIZE.

GLOBE OIL CUPS.—FULL SIZES.

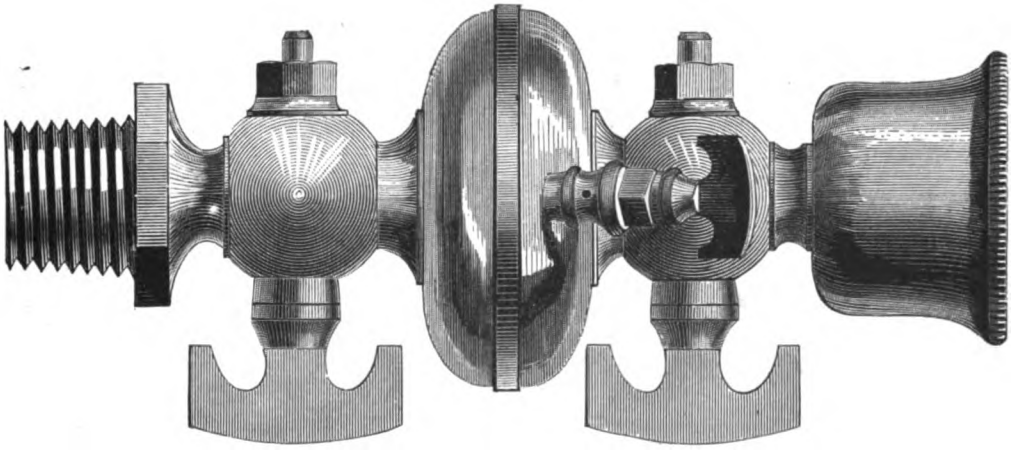


FIGURE 606. No. 0.

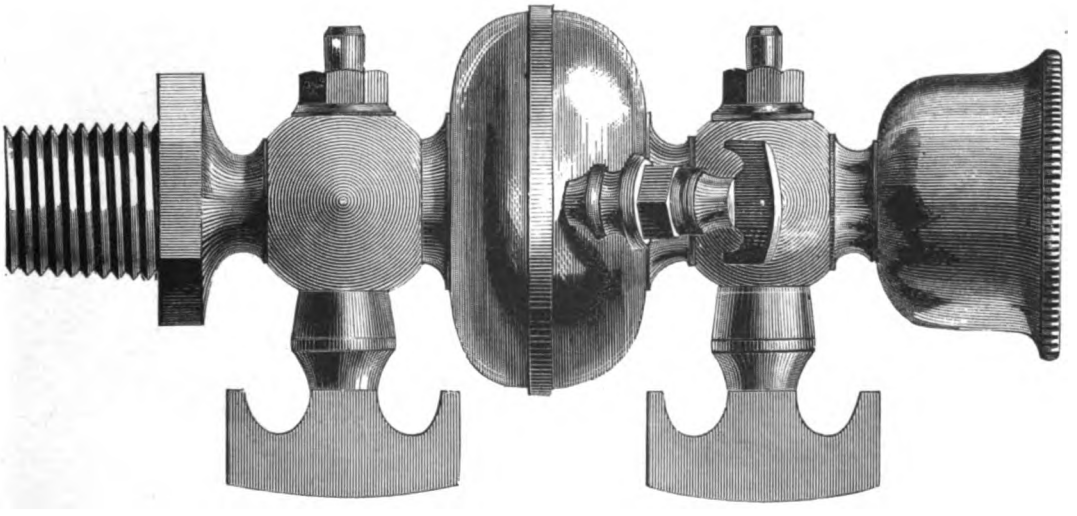


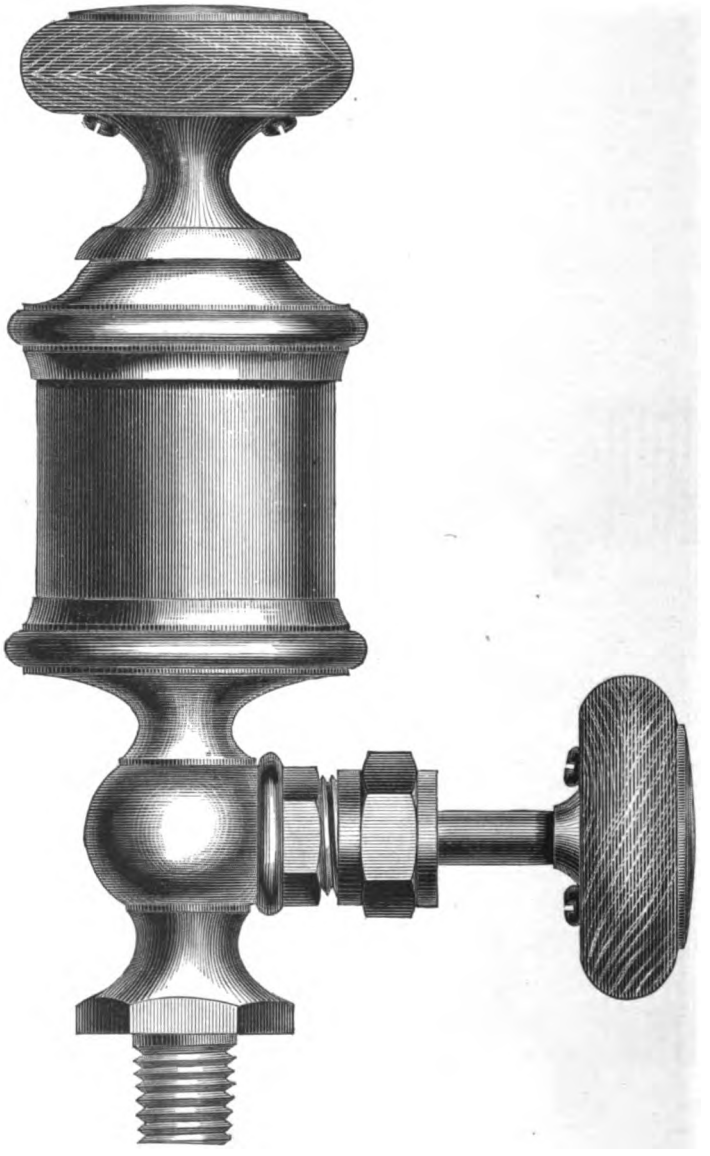
FIGURE 607. No. 1.

BRASS GOODS.

COMMON LUBRICATOR.—Full Size.

FIGURE 608.

No. 3.

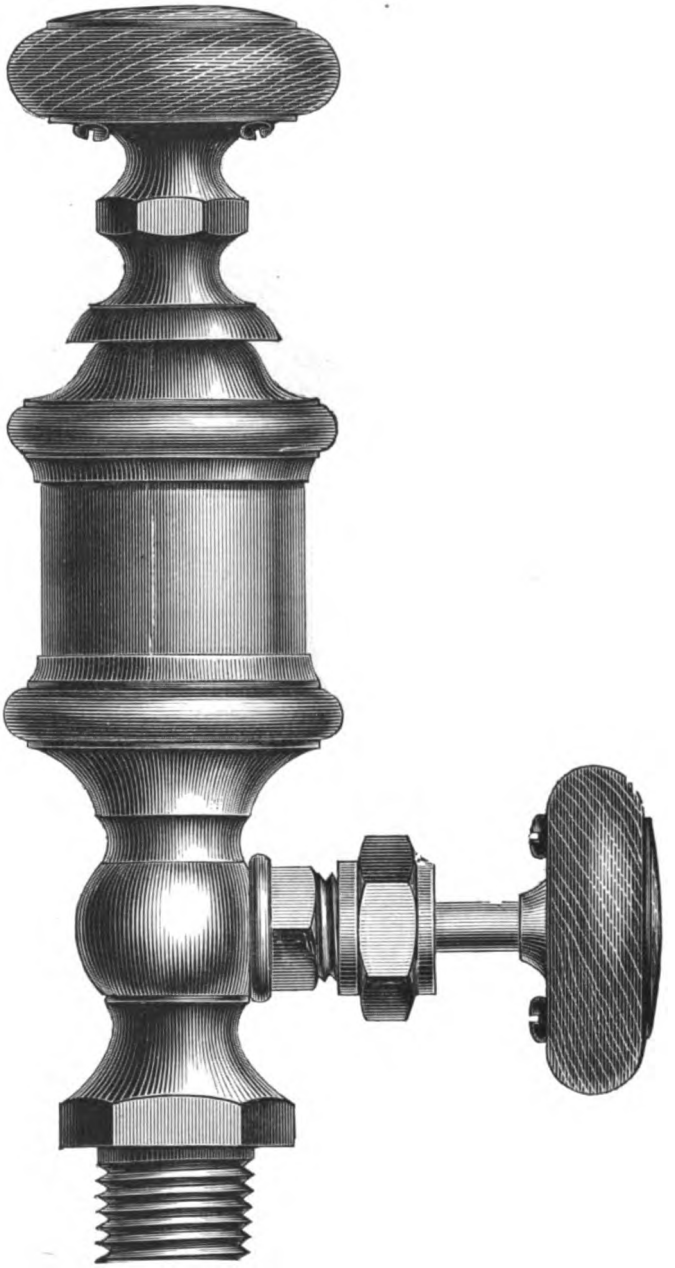


BRASS GOODS.

COMMON LUBRICATOR.—FULL SIZE.

FIGURE 609.

No. 4.

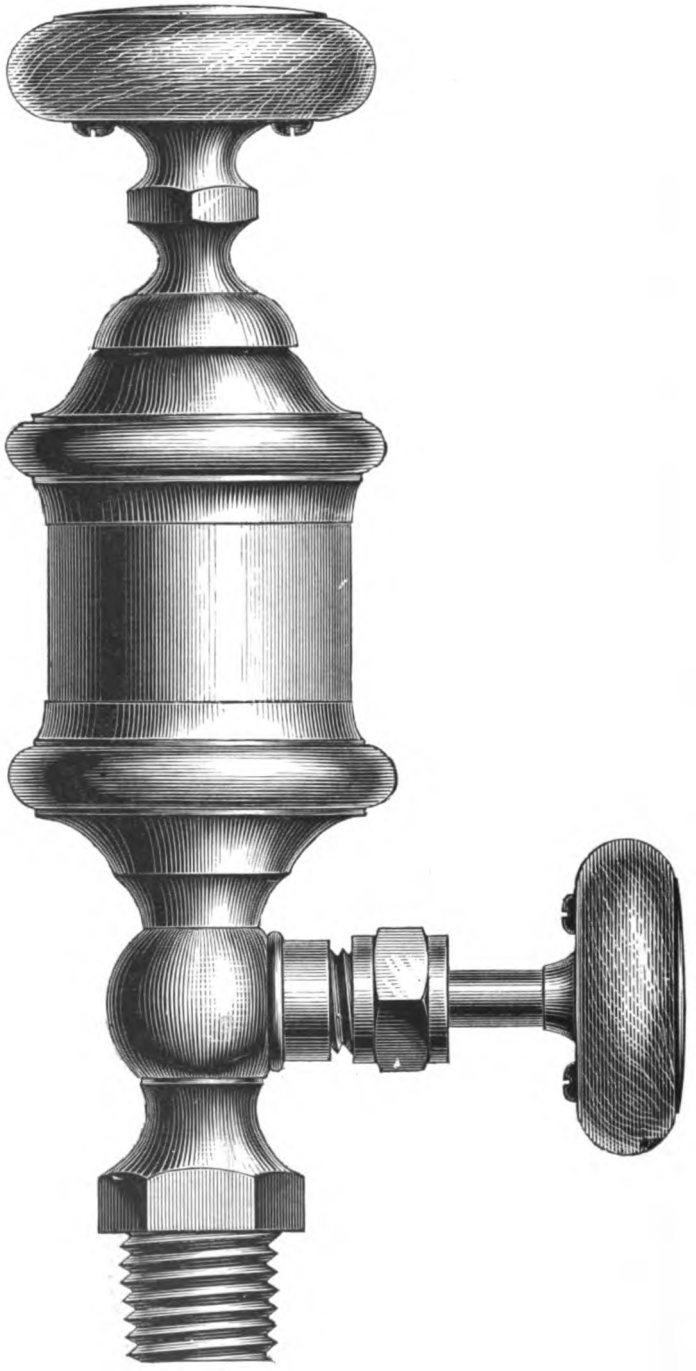


BRASS GOODS.

COMMON LUBRICATOR.—Full Size.

FIGURE 610.

No. 5.



BRASS GOODS.

COMMON LUBRICATOR.—FULL SIZE. No. 6.

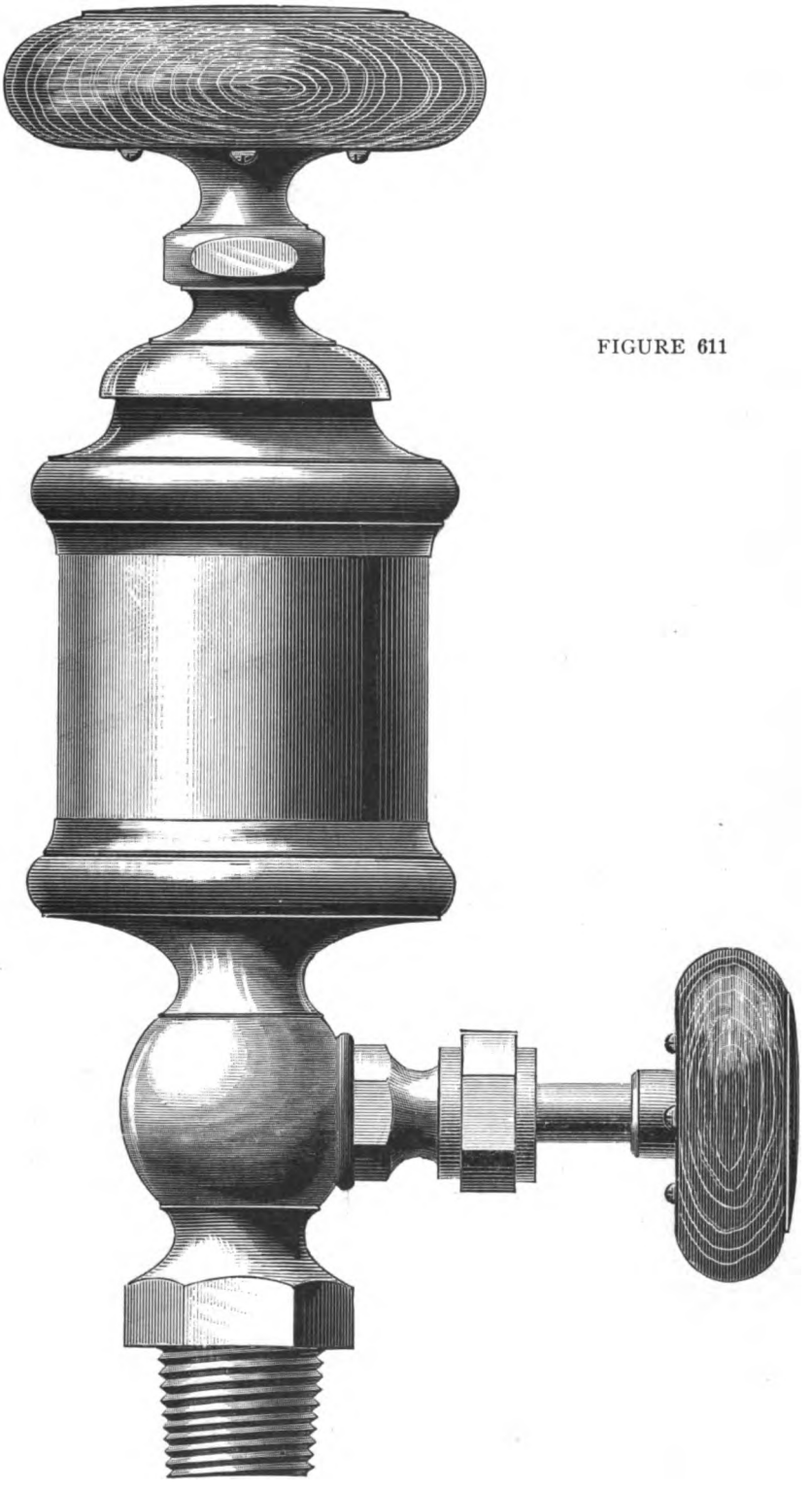
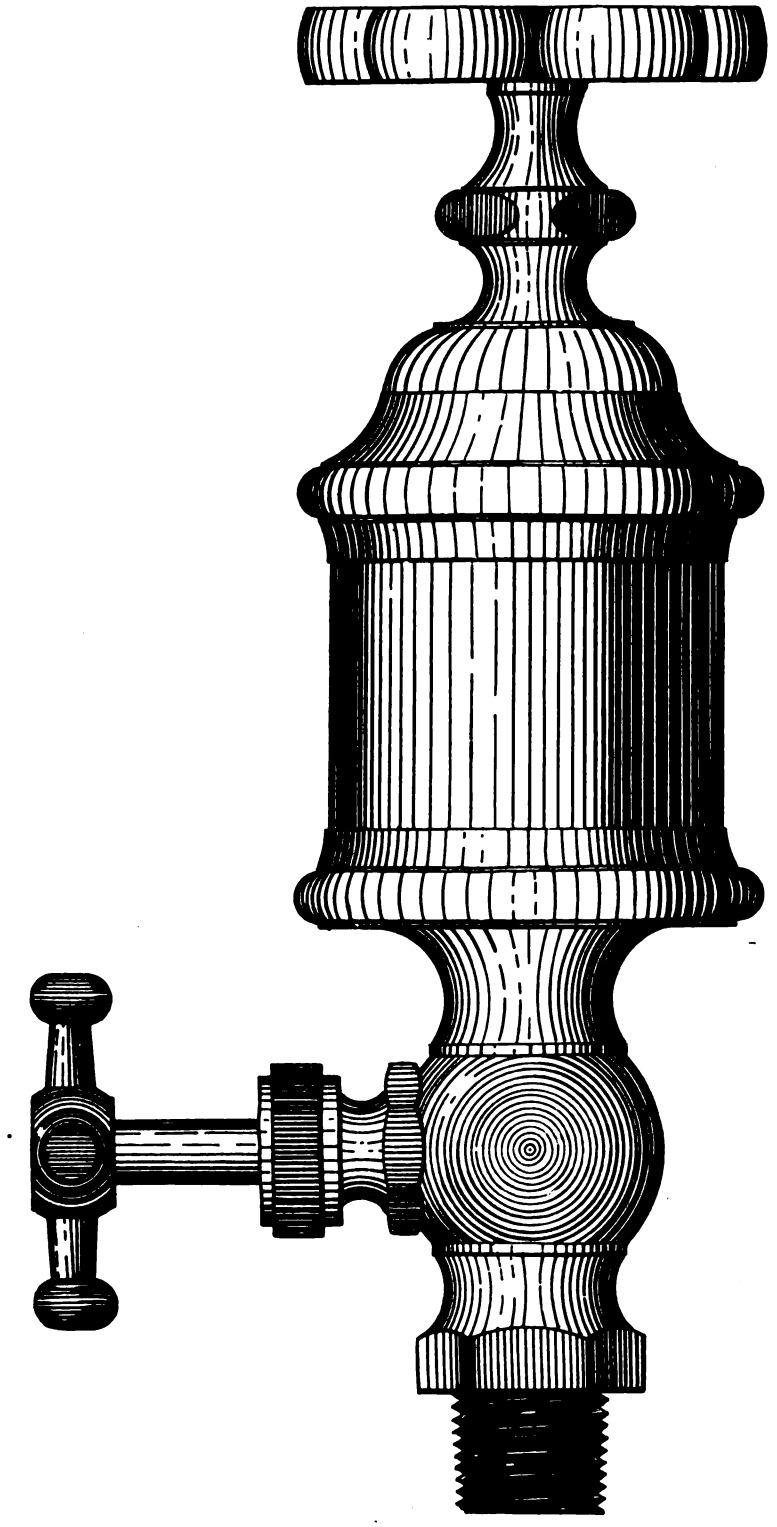


FIGURE 611

BRASS GOODS.

IRON BODY LUBRICATOR.—Full Size

FIGURE 612.



BRASS GOODS.

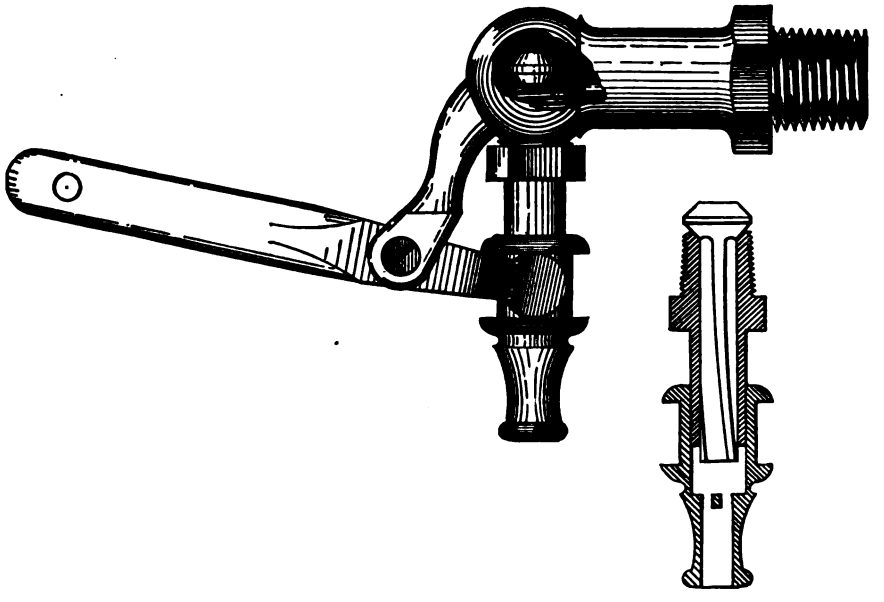
GAUGE COCK.

FIGURE 621.

Blank or threaded for ⅜, ½ or ¾ inch pipe.

PILKINGTON'S PATENT GAUGE COCK.

FIGURE 622.



BRASS GOODS.

WATER GAUGES.

FIGURE 625.

No. 3¼.

Iron Body and Wheels, Two Guards. For ½ in. Pipe.

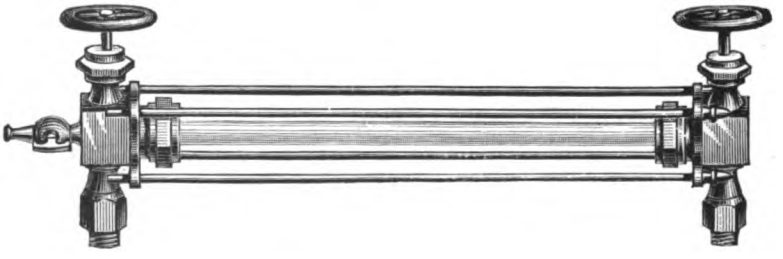
FIGURE 626.

No. 3½.

Brass, Iron Wheels, Two Guards. For ½ in. Pipe.

FIGURE 627.

No. 4.



Brass, Iron Wheels, Four Guards. For ½ in. Pipe.

Every boiler should have one of these water gauges. The ends are connected to the boiler, the right-hand end above, and the left-hand end below, the water line. The cocks are then opened and the water flows in at the bottom, and the steam at the top.

The cylinder is of strong tempered glass, adapted to withstand both heat and pressure, and in it *the exact height of the water can always be seen.* By the cock at the left dirty water, or sediment, can be drawn off.

Nos. 3½ and 4 will be furnished with wood or brass wheels when so ordered.

BRASS GOODS.

STEAM WHISTLES.

FIGURE 635.

No. 1.

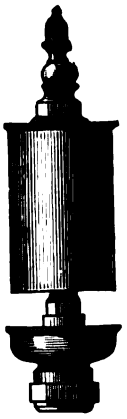
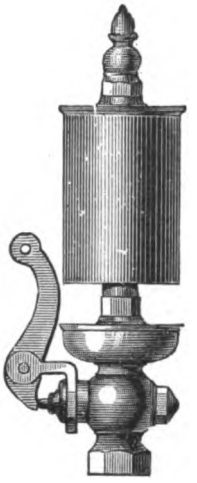


FIGURE 636

No. 2.

FIGURE 637.

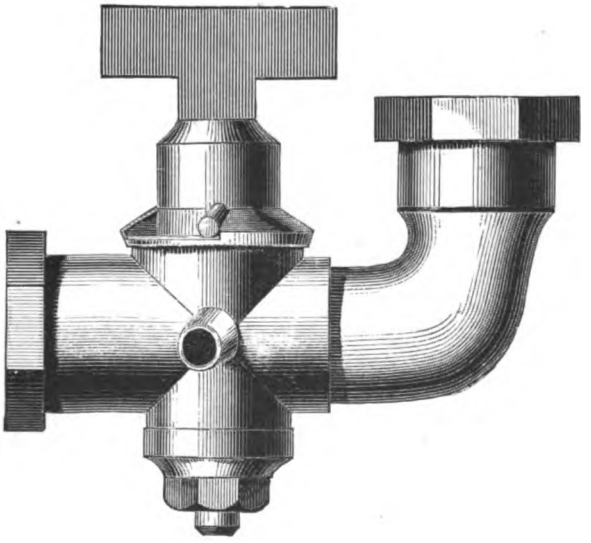
No. 3.



HYDRANT COCK.

With Stop and Waste.

FIGURE 640.

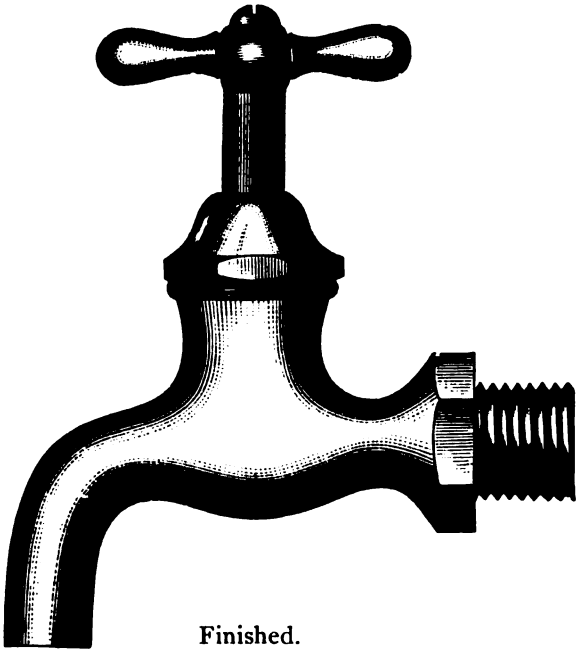


BRASS GOODS.

COMPRESSION PLAIN BIBBS.

SCREWED FOR IRON PIPE.

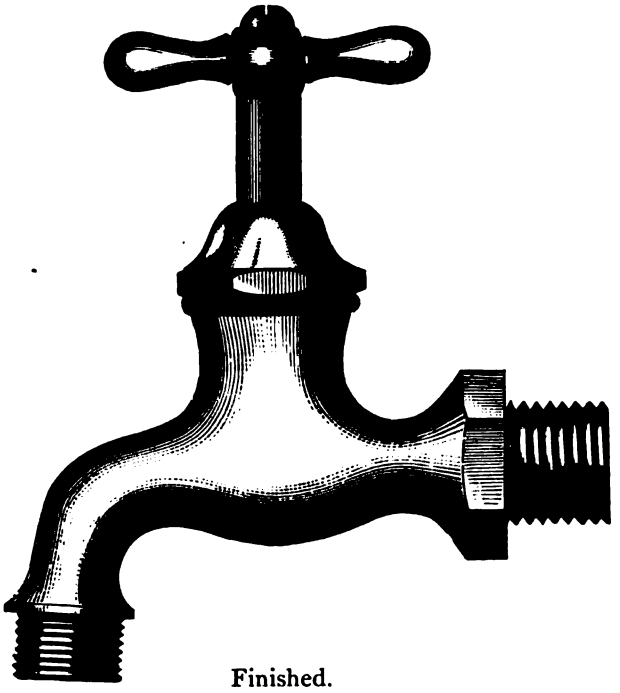
FIGURE 645.



Finished.

COMPRESSION HOSE BIBB.

FIGURE 646.



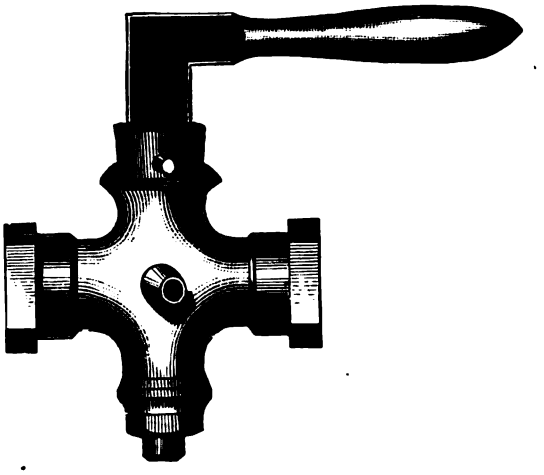
Finished.

BRASS GOODS.

STOP AND WASTE COCKS.

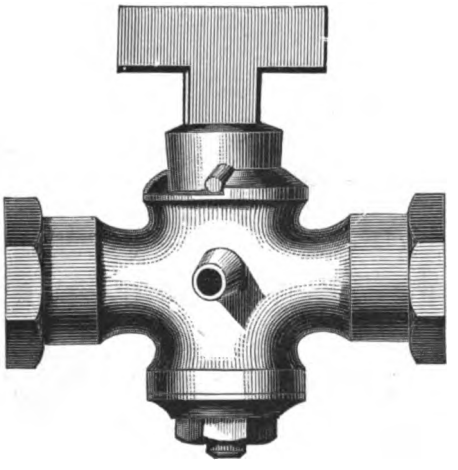
Rough Lever Handle.—Screwed for Iron Pipe.

FIGURE 650.



Rough 'T' Handle.—Screwed for Iron Pipe.

FIGURE 651.



BRASS GOODS, &c.

HOSE PIPES.

PLAIN.

FIGURE 660.

Short or Long.

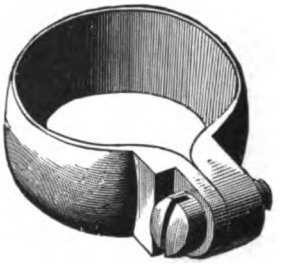
COCK, LARGE END.

FIGURE 661.

Short or Long.

HOSE CLAMP.

FIGURE 662.



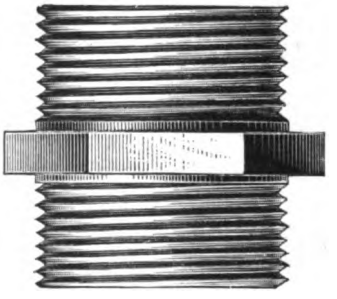
HOSE COUPLING.

FIGURE 663.

For all sizes of hose.

HOSE AND PIPE NIPPLE.

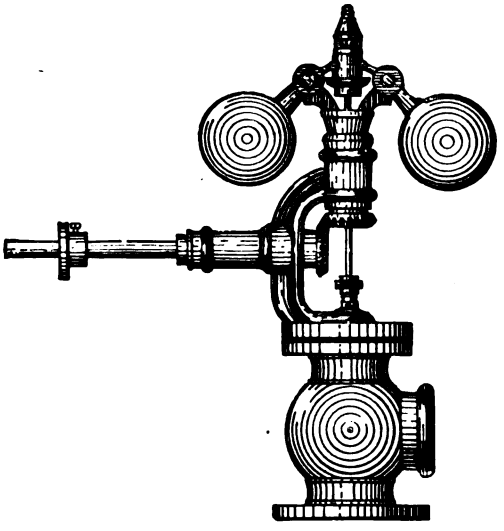
FIGURE 664.



To connect hose and pipe thread.

GOVERNOR.

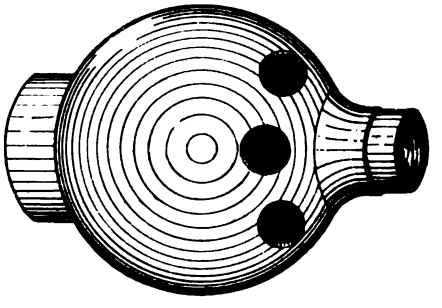
FIGURE 670.



For regulating the speed of an engine.

GAS BURNER.—ATMOSPHERIC.

FIGURE 674.

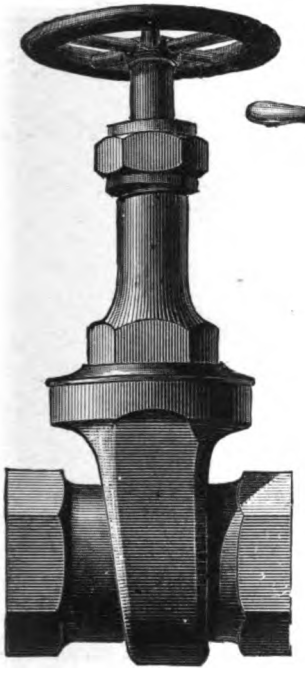


Rough, finished or plated.

GATE VALVES.

BRASS.

FIGURE 685.

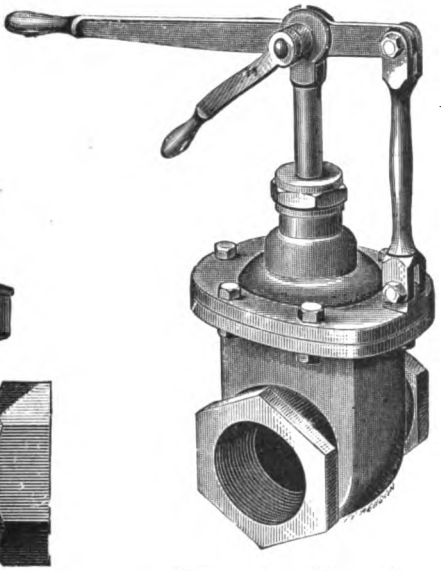


Screwed.

QUICK OPENING.

BRASS OR IRON.

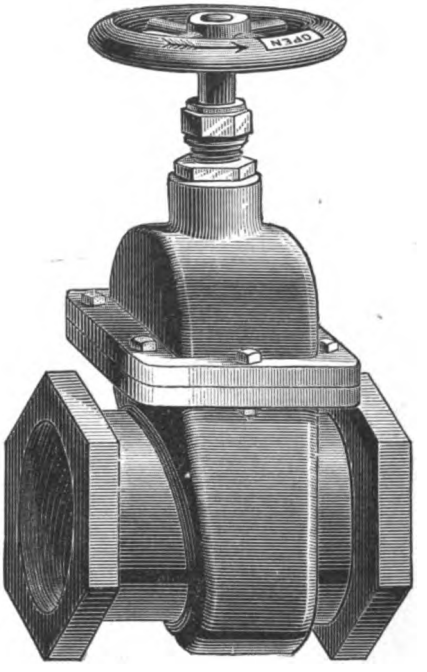
FIGURE 686.



Screwed or Flanged.

IRON BODY.

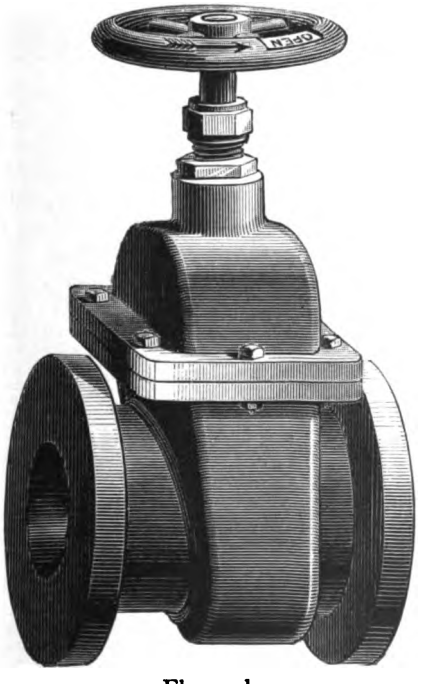
FIGURE 687.



Screwed.

IRON BODY.

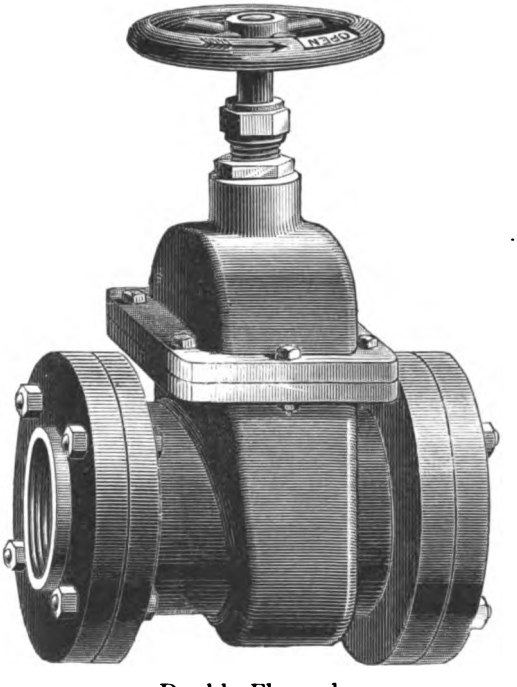
FIGURE 688.



Flanged.

IRON BODY.

FIGURE 689.



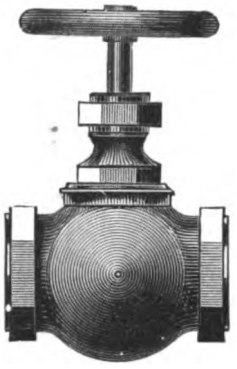
Double Flanged.

IRON BODY VALVES.

GLOBE VALVES.

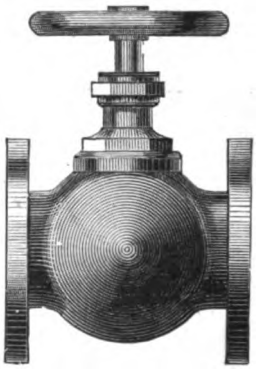
BRASS MOUNTED.

FIGURE 690.



Screwed.

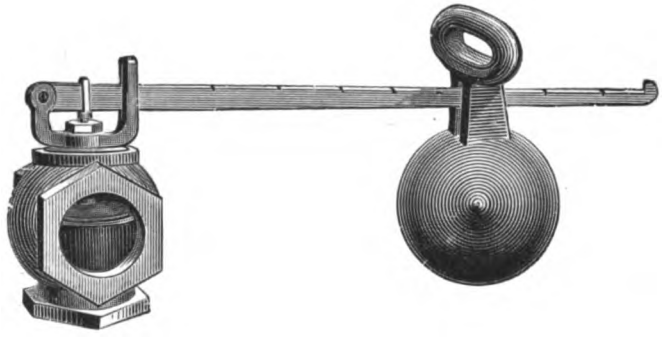
FIGURE 691.



Flanged.

SAFETY VALVE.

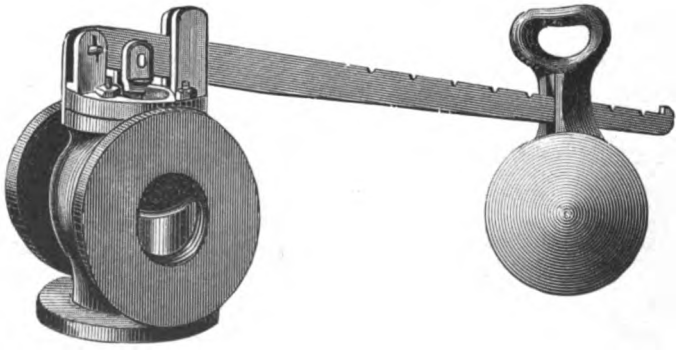
FIGURE 692.



Screwed.

SAFETY VALVE.

FIGURE 693.



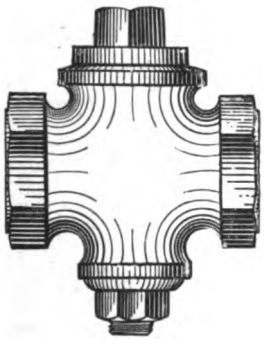
Flanged.

GLOBE AND SAFETY VALVES WITH EXTRA FLANGES BOLTED ON, TO ORDER.

IRON COCKS.

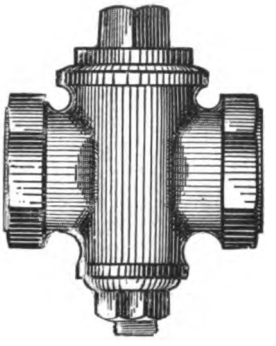
No. 1. Heavy.

FIGURE 700.



No. 2. Light.

FIGURE 701.



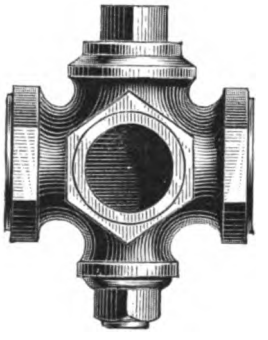
With Brass Washers.

Round-Way.

FIGURE 702.

Three-Way.

FIGURE 703.

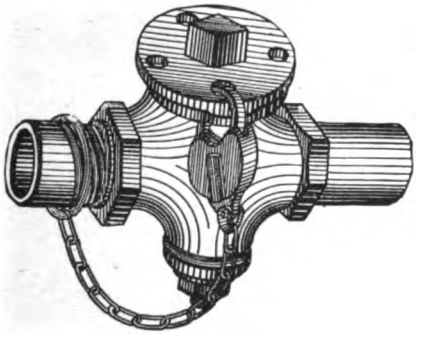


With Brass Washers.

LOCK COCKS.

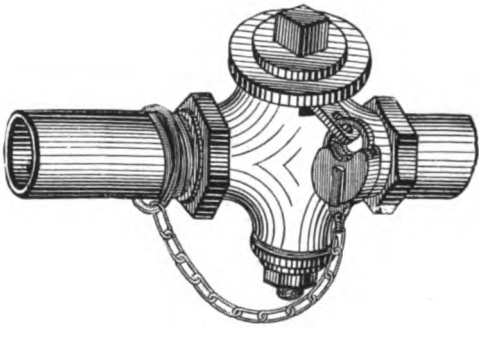
Flanged Top.

FIGURE 704.



Essex Patent.

FIGURE 705.



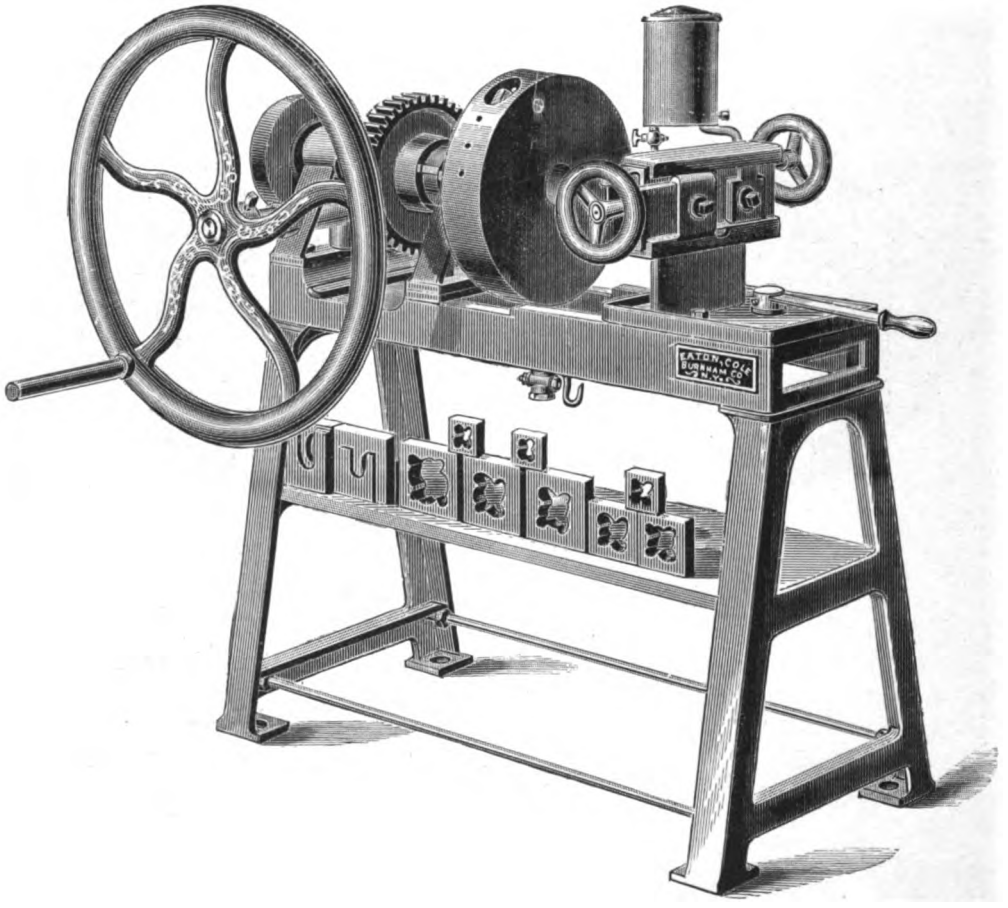
With Brass Washers Locks extra.

PIPE MACHINE.

HAND PIPE MACHINE.

FOR CUTTING SCREW THREADS ON PIPE FROM ⅛ TO 2 INCH, INCLUSIVE.

FIGURE 710.



Power Attachment, extra.

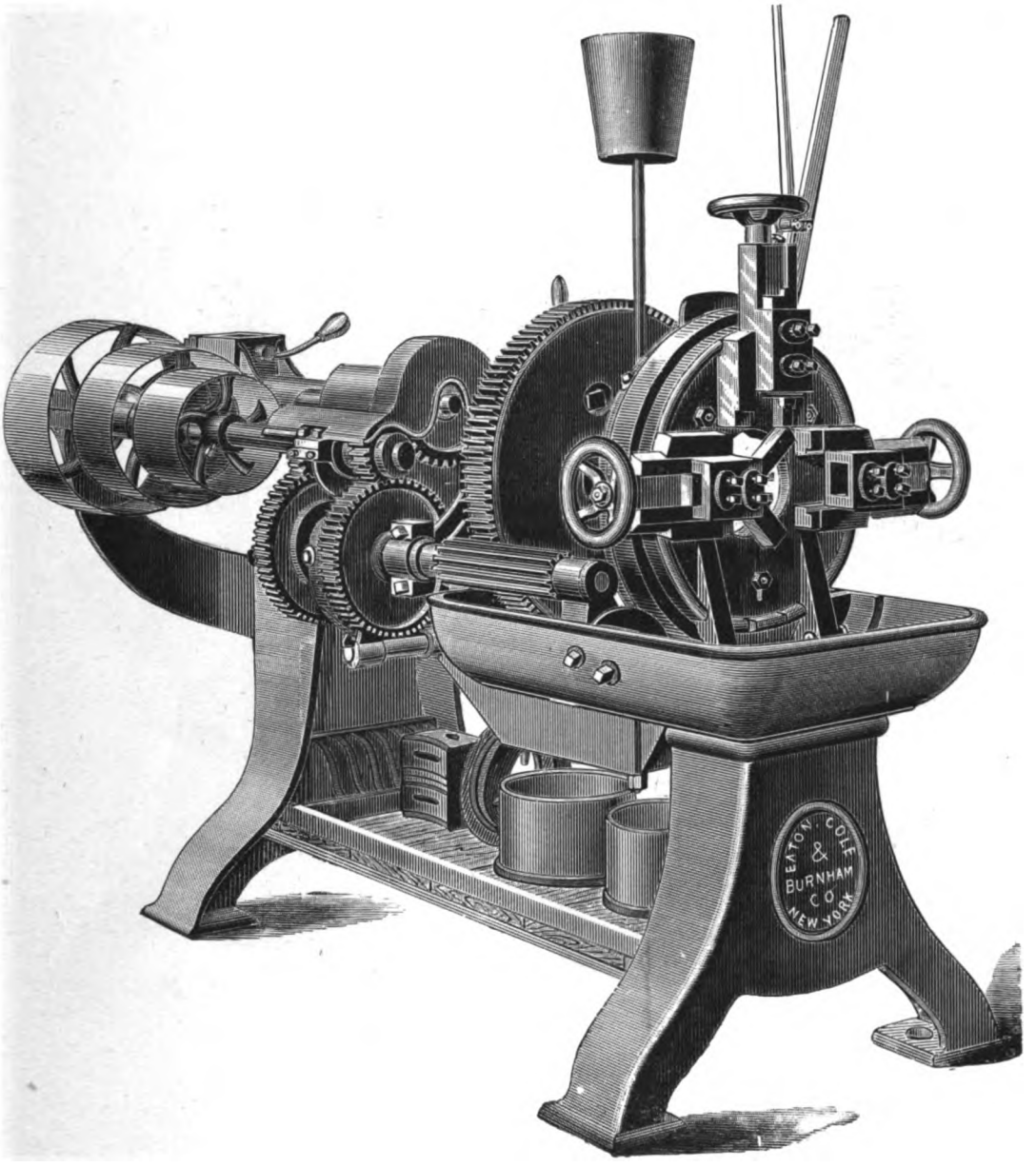
LARGE PIPE MACHINE.

WITH COUNTERSHAFT AND PULLEY.

Solid Dies, ¾, 1, 1¼ and 1½ inch. Open Dies, 2 to 6 inch, inclusive.

To Cut and Screw-Thread Steam Pipe, Casing and Line Pipe.

FIGURE 711.



Same style of machine to cut threads on every size up to 8 inch pipe.

LARGE PIPE MACHINE.

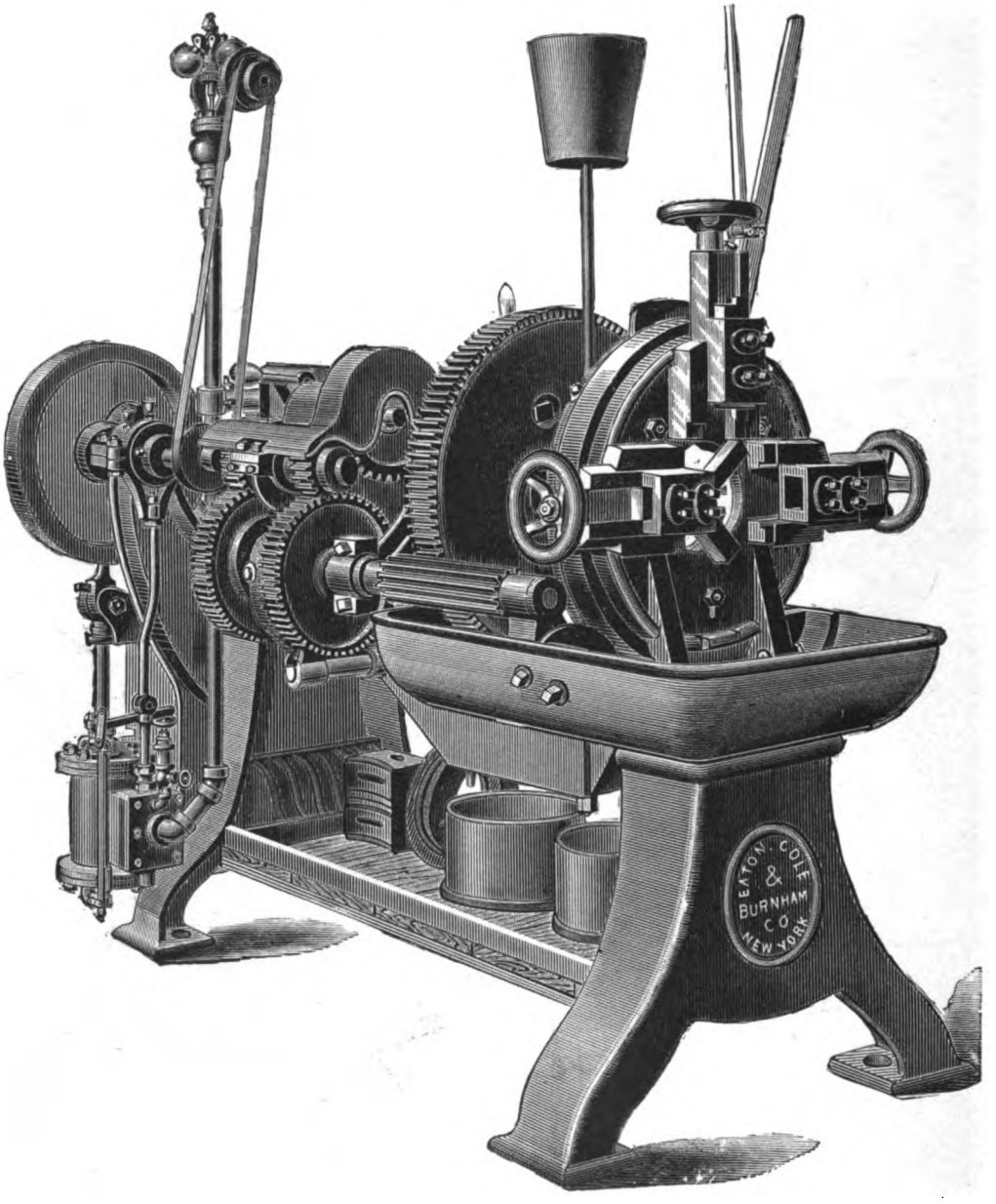
WITH ENGINE ATTACHMENT.

(Requires no Countershaft nor Pulleys.)

Solid Dies, ¾ inch to 1½ inch, inclusive. Open Dies, 2 inch to 6 inch, inclusive.

For Cutting Screw Threads on Pipe, Casing and Line Pipe.

FIGURE 712.

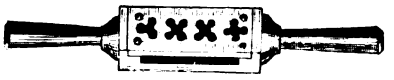


The Most Complete and Perfect Machine Made.

Same style of machine to cut up to 8 inch pipe.

STOCKS AND DIES.

No. 0. FIGURE 715.



Threads ⅛, ¼, ⅜ and ½ inch Pipe.

No. 00. FIGURE 716.

Threads ⅛, ¼, ⅜, ½, ¾ and 1 inch Pipe.

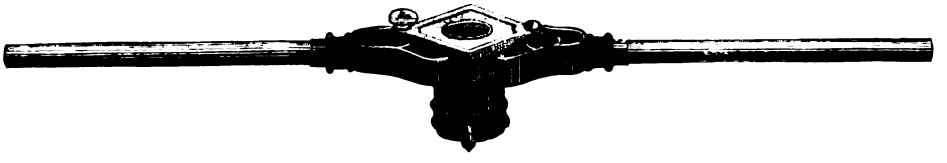
No. 1. FIGURE 717.

Threads ⅛, ¼, ⅜, ½, ¾ and 1 inch Pipe.
Size of Dies to Thread ⅛, ¼ and ⅜ inch Pipe, 2 inches square by ½ inch thick.
" " " ½, ¾ and 1 " " 2 " " ⅝ " "

No. 2. FIGURE 718.

Threads ¾, 1 and 1¼ inch Pipe.
Size of Dies, 3 inches square by ¾ inch thick.

No. 3. FIGURE 719.



With Driving Screw.

Threads 1¼, 1½ and 2 inch Pipe.
Size of Dies, 4 inches square by 1 inch thick.

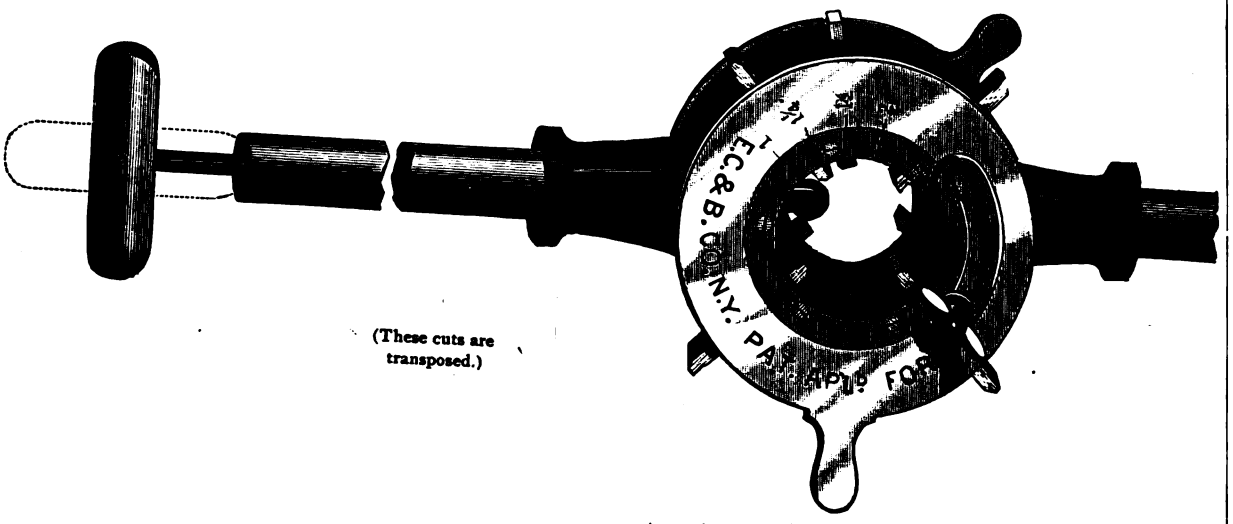
No. 4. NOT ILLUSTRATED.

Threads 2½ and 3 inch Pipe.
Size of Dies, 5 inches square by 1¼ inches thick.

ADJUSTABLE STOCKS.

STRONG'S ADJUSTABLE STOCK, WITH PIPE CUTTER.

FIGURE 725.

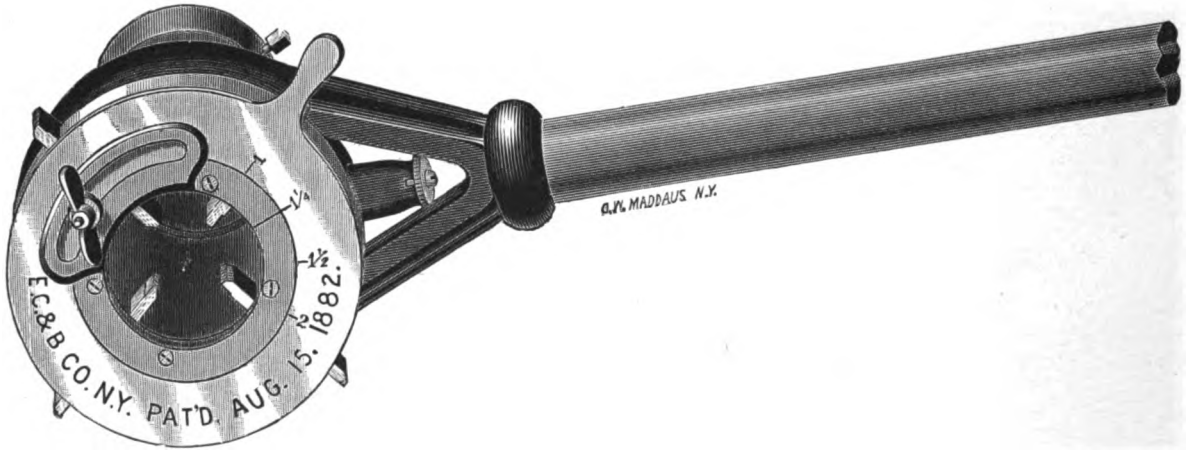


No. 3 cuts and threads 1, 1¼, 1½ and 2 inch pipe.

Both the Dies and the Guides are adjustable. The cutting-off tool is a Stanwood Cutter. When not in use the handle of the cutter is turned the same way as the handle of the stock and becomes a part of it.

ADJUSTABLE RATCHET STOCK.

FIGURE 726.



PROCTOR'S PATENT.

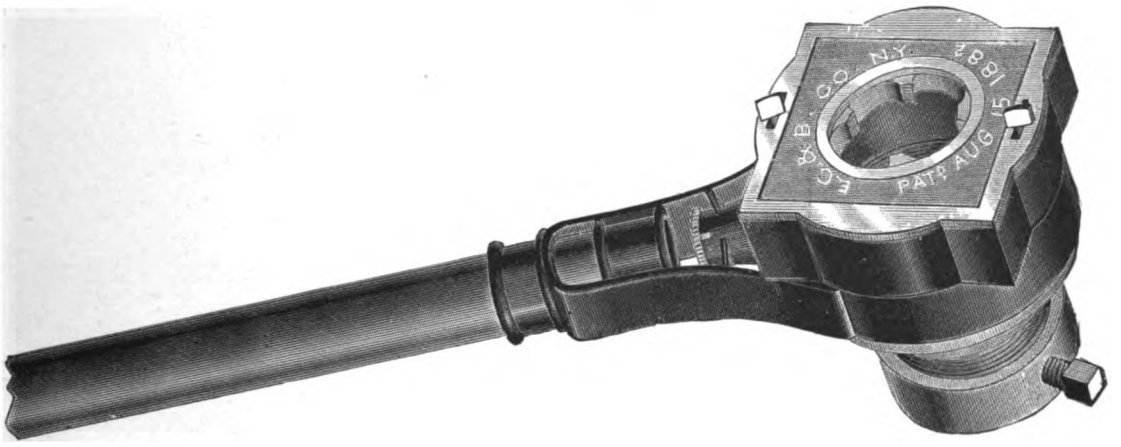
No. 3 threads 1, 1¼, 1½ and 2 inch pipe.

The Dies only are adjustable. The Guides are separate. The Stock will ratchet either way. One man can thread two inch pipe with perfect ease.

RATCHET STOCK.

PROCTOR'S PATENT.

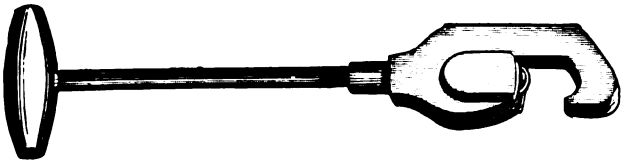
FIGURE 727.



Solid Dies, 4 inches square by 1 inch thick.
No. 3 threads all sizes of pipe to and including 2 inch. With Driving Screw.
Ratchets either way.
One man can thread 2 inch pipe with perfect ease.

STANWOOD PIPE CUTTER.

FIGURE 730.



THREE SIZES.

No. 1 cuts from ⅛ to 1 inch pipe. No. 2 cuts from ¾ to 2 inch pipe. No. 3 cuts from 1½ to 3 inch pipe.

EXTRA BLOCKS FOR ABOVE.

WHEEL FOR STANWOOD CUTTER.

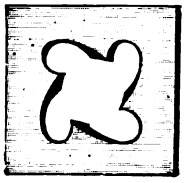
FIGURE 731.

Three different sizes. For Nos. 1, 2 and 3 Cutters.

DIES, TAPS, &c.

SOLID DIES.—Right or Left.

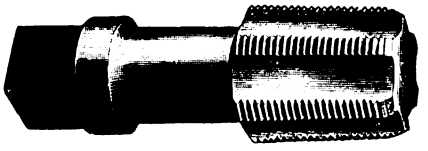
FIGURE 740



All sizes from ⅛ to 3 inch.

GAS PIPE TAP.

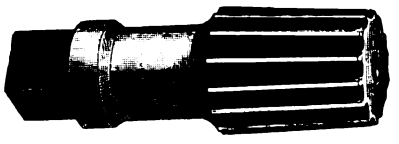
FIGURE 741.



All sizes from ⅛ to 3 inch.

GAS PIPE REAMER.

FIGURE 742.

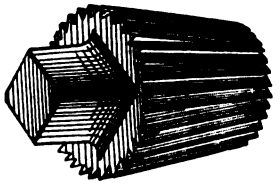


All sizes from ⅛ to 3 inch.

REAMER AND BLOCK FOR PIPE MACHINE.

Reamer.

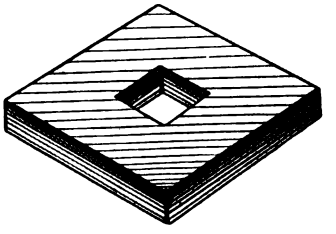
FIGURE 743.



Different Sizes.

Block.

FIGURE 744.



To hold Reamer in machine.

PIPE TONGS.

COMMON PIPE TONGS.

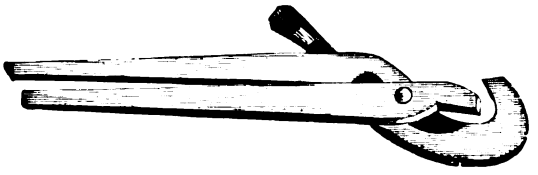
FIGURE 745.

All sizes from ⅛ to 4 inch.

BROWN'S PATENT ADJUSTABLE PIPE TONGS.

Our Own Make.—Drop Forged.

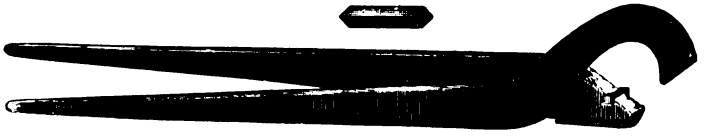
FIGURE 746.



No. 1 takes ⅛, ¼, ⅜, ½ and ¾ inch pipe.
No. 1½ " ¾ and 1 inch pipe.
No. 2 " ½, ¾, 1 and 1¼ inch pipe.
No. 3 takes 1, 1¼, 1½ and 2 inch pipe.
No. 4 " 1½, 2, 2½ and 3 inch pipe.
No. 5 " 2½, 3, 3½ and 4 inch pipe.
No. 6 takes 3, 3½, 4 and 5 inch tongs.

LAY'S PATENT PIPE TONGS.

FIGURE 747.



Twelve different sizes, from ¾ to 6 inch.

WORDEN'S PATENT PIPE TONGS.

FIGURE 748.

Twelve sizes.

Extra Bits for the Lay and Worden Tongs kept in stock.

PIPE TONGS.

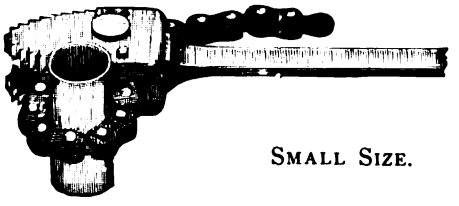
"ACME" ADJUSTABLE TONG.

FIGURE 749.

No. 1 takes ⅛ to ¾ inch.
No. 2 " ¼ " 1½ "
No. 1½ takes ½ to 1¼ inch.
No. 3 " ½ " 2½ "
No. 4 takes ¾ to 4 inch.

BROCK'S PATENT CHAIN TONGS.

FIGURE 750.



SMALL SIZE.

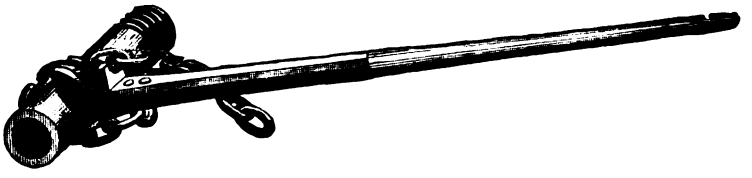
FIGURE 751.

LARGE SIZE.

No. 1 takes from ⅛ to 2 inch pipe.
No. 3 " " 1 " 4 " "
No. 2 takes from ¼ to 2½ inch pipe.
No. 4 " " 2 " 8 " "
No. 5 takes from 3 to 12 inch pipe.

ROBBINS' PATENT PIPE WRENCH.

FIGURE 752.

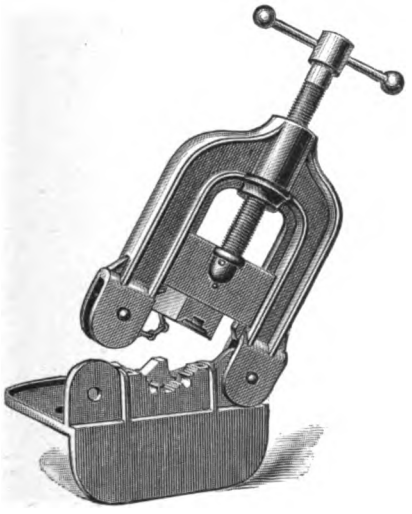


Size.	Length of Lever.	Size of Lever near Claw.	Diameter of Chain.	Average Weight.	Size of Pipe Adapted To.
No. 2.	27 inches.	1⅛ inch.	5/16 inch.	7 lbs.	1 inch to 2 inch.
" 3.	3 feet.	1¼ "	5/16 "	12 "	1¼ " 4 "
" 4.	4 "	1½ "	⅜ "	24 "	2 " 6 "
" 5.	5 "	1¾ "	½ "	33 "	2½ " 8 "
" 6.	6 "	2 "	⅝ "	50 "	4 " 10 "
" 7.	7 "	2½ "	¾ "	100 "	4 " 16 "

PIPE VISES.

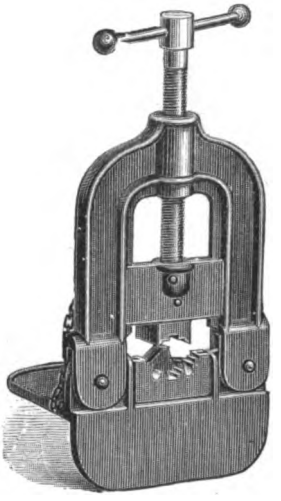
MALLEABLE IRON PIPE VISE.

FIGURE 760.



Open.

A very light, strong and cheap Vise.

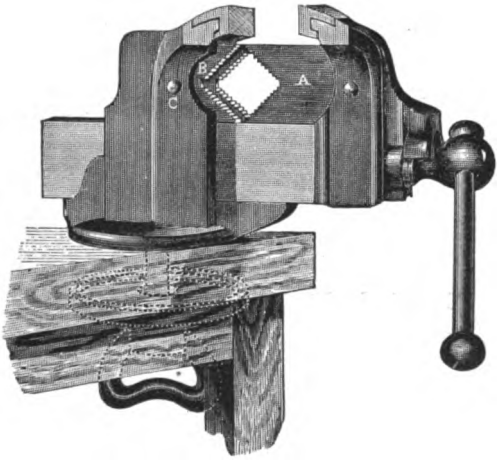


Closed.

No. 1 takes ⅛ to 2 inch pipe, inclusive.
No. 2 " ⅛ to 3 " "

SMITH'S COMBINATION VISE.

FIGURE 761.



No. 1 takes ⅛ to 2 inch pipe, inclusive.
No. 2 " ⅛ to 3 " " "

MISCELLANEOUS.

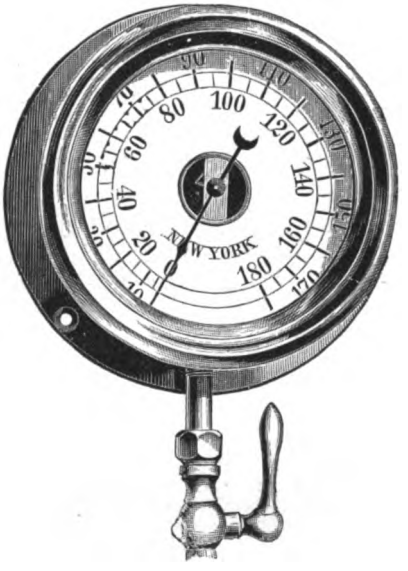
BABBITT METAL.

FIGURE 770.

All grades.

STEAM GAUGES.

FIGURE 774.



Iron or Brass Cases.

SYPHON FOR STEAM GAUGES.

FIGURE 775.

Made of ¼ inch pipe.

MISCELLANEOUS.

COLD CHISEL.

Generally about six inches long.

FIGURE 776.

CROW BAR.

Generally five feet long.

FIGURE 777.

Iron or Steel.

SOLID STEEL PUNCH.

FIGURE 778.

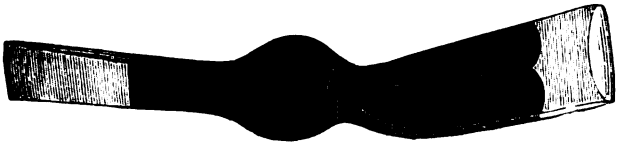
SPLITTING CHISEL.

FIGURE 779.

Handled to order.

MATTOCK.

FIGURE 780.

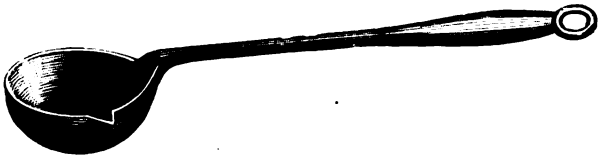


PICK.

FIGURE 781.

MELTING LADLE.

FIGURE 782.



BELT HOOK.

FIGURE 783.

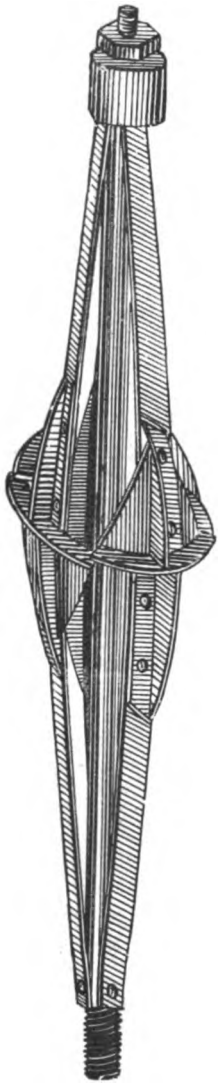
BELT PUNCH.

FIGURE 784.

MISCELLANEOUS.

FLUE SCRAPER (FREEMAN'S).

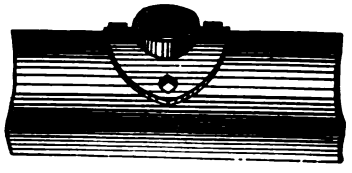
FIGURE 785.



All sizes.

CASING FLANGE.

FIGURE 788.

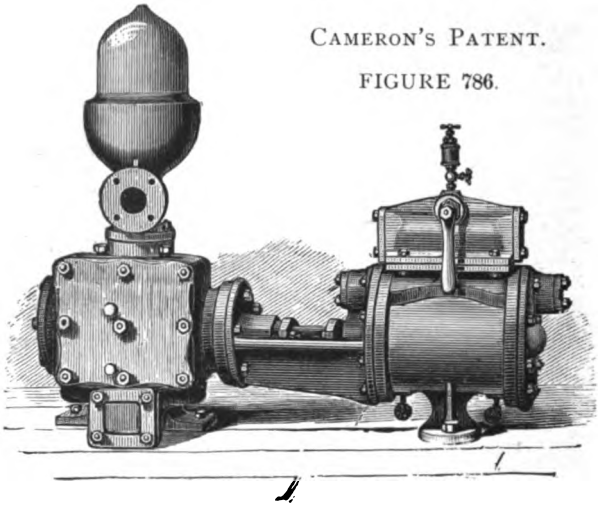


The flange is bolted on the casing so as to connect pipe to it.

STEAM AND OIL PUMPS.

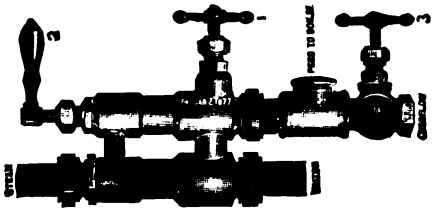
CAMERON'S PATENT.

FIGURE 786.



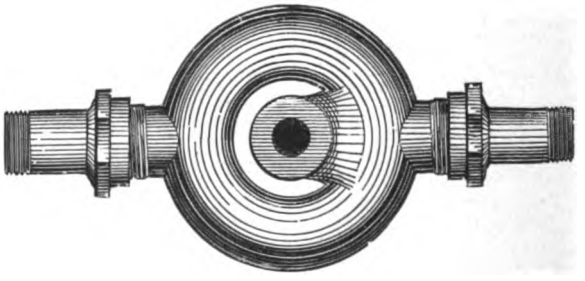
See special circular for sizes and description.

INSPIRATORS (HANCOCK'S). FIGURE 787.



Number.	Size of Connections.		Gallons per hour with steam at 60 lbs. Pressure
	Suction and Feed.	Steam.	
No. 7½	⅜	⅜	60
No. 8¾	"	⅜	85
No. 10	½	⅜	120
No. 12½	¾	½	220
No. 15	¾	½	300
No. 17½	1	¾	360
No. 20	1	¾	540
No. 22½	1¼	1	700
No. 25	1¼	1	900
No. 30	1½	1¼	1260
No. 35	1½	1¼	1740
No. 40	2	1½	2230
No. 45	2	1½	2820
No. 50	2½	2	3480

STEAM JET PUMP. FIGURE 789.



Size of Pump.....inch	¾	1	1¼	1½	2	2½	3	
Suction Pipe..... .... "	¾	1	1¼	1½	2	2½	3	
Discharge Pipe..... "	½	¾	1	1¼	1½	2	2½	
Steam Pipe..... "	⅜	½	½	¾	¾	1	1	
Steam Opening ..... "	8/16	4/16	5/16	6/16	7/16	8/16	9/16	
Capacity per minute...Gall.	8	15	20	30	40	50	60	

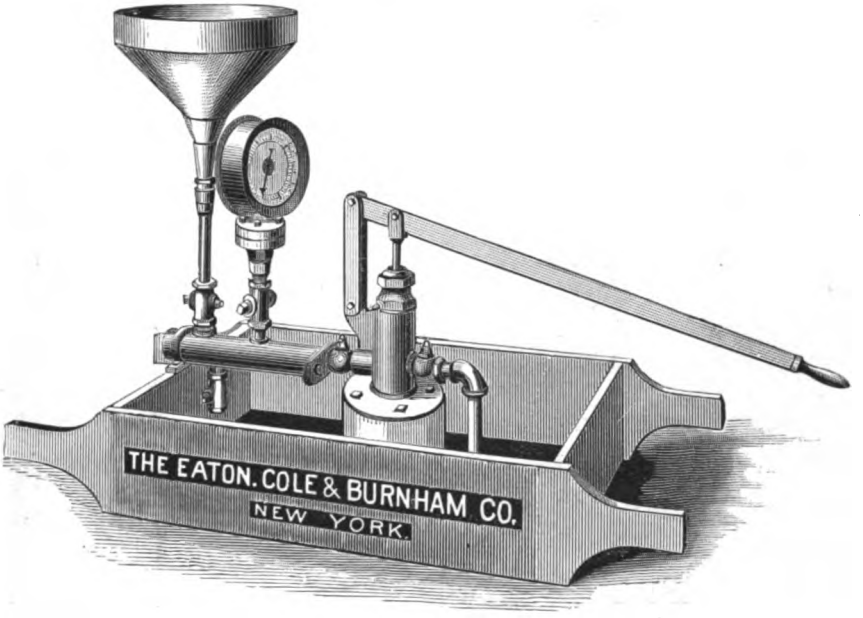
MISCELLANEOUS.

DIFFERENTIAL PULLEY BLOCKS.

FIGURE 790.

HYDRAULIC PIPE TESTING MACHINE.

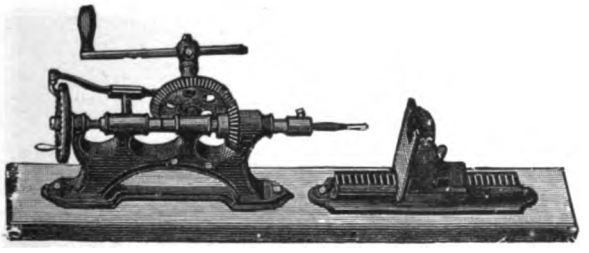
FIGURE 791.



Will test up to 2,500 pounds per square inch.

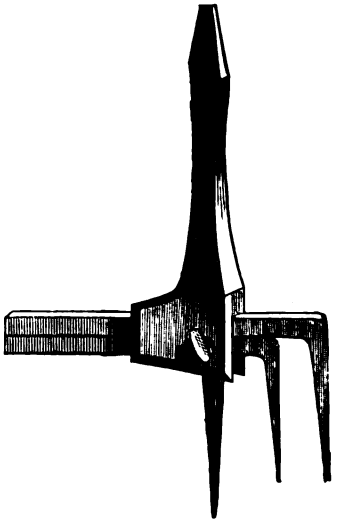
SELF-FEEDING UPRIGHT DRILL.

FIGURE 792.



WASHER CUTTER.

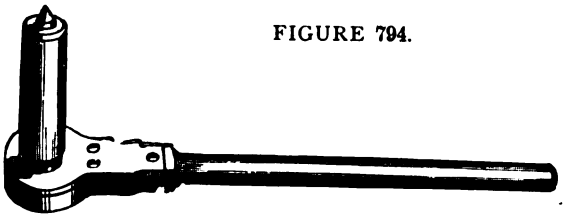
FIGURE 793.



For cutting washers or gaskets.

RATCHET DRILL.

FIGURE 794.



BLACKSMITH'S TAPER TAP.

FIGURE 795.

Sizes from $\frac{5}{16}$ to $1\frac{1}{2}$ inch.

MISCELLANEOUS.

WOODEN PULLEY BLOCKS.

SINGLE. FIGURE 796.

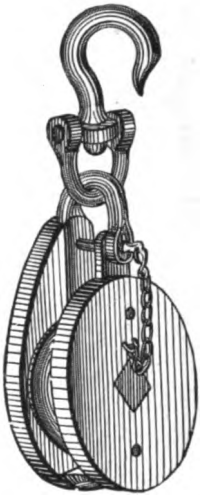
DOUBLE. FIGURE 797.

TRIPLE. FIGURE 798.

With or without a becket. Figure 796 shows the becket.

SNATCH BLOCK.

FIGURE 799.



With loose swivel hook.

WROUGHT IRON PULLEY BLOCKS.

SINGLE. FIGURE 800.

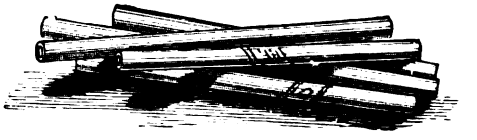
DOUBLE. FIGURE 801.

TRIPLE. FIGURE 802.

With or without a becket.

GAUGE GLASSES.

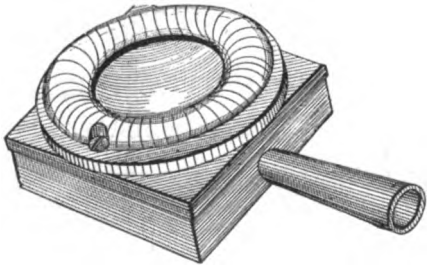
FIGURE 803.



For Figures 625, 626 and 627, page 106.

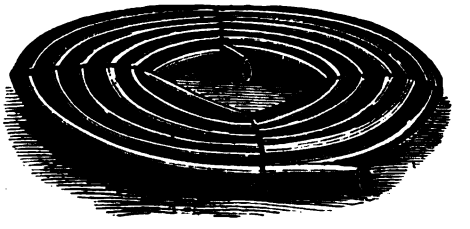
TUYERE IRON FOR FORGE.

FIGURE 804.



HOSE.

FIGURE 805.

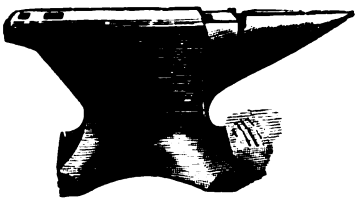


All sizes.

HARDWARE.

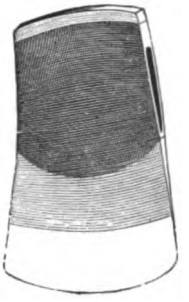
ANVIL.

FIGURE 850.



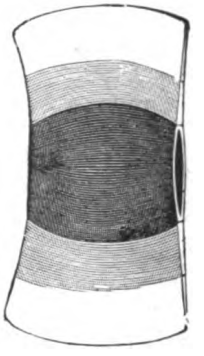
SINGLE BIT AXE.

FIGURE 851.



DOUBLE BIT AXE.

FIGURE 852.



AUGER BIT.

FIGURE 853.

AUGER.

FIGURE 854.

CAR AUGER BIT.

FIGURE 855.

DOUBLE CUT GIMLET BIT.

To make rivet holes in sucker rods.

FIGURE 856.

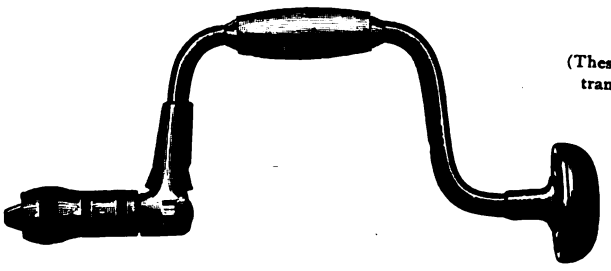
EXPANSIVE BIT (CLARK'S).

FIGURE 857.

HARDWARE.

BRACE.

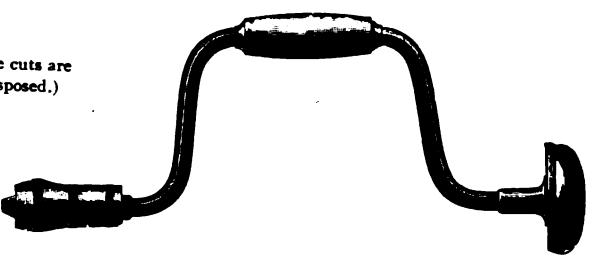
FIGURE 858.



(These cuts are transposed.)

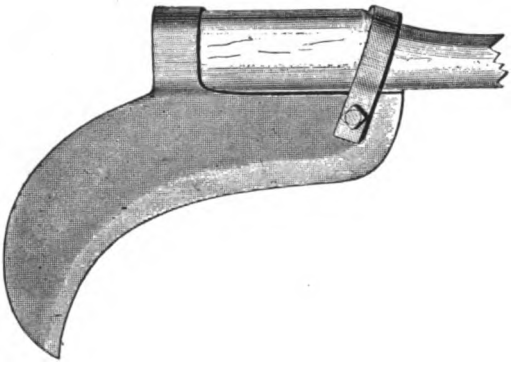
RATCHET BRACE.

FIGURE 859.



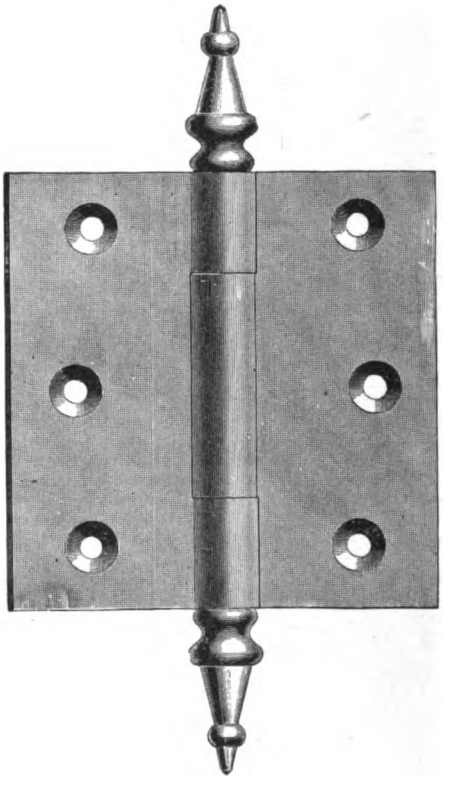
BUSH HOOK.

FIGURE 860.



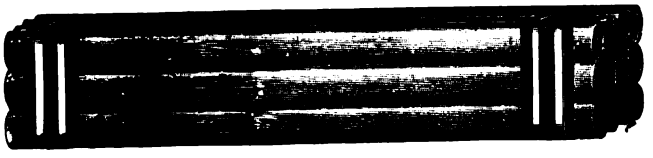
BUTT HINGES ("ACORN").

FIGURE 861.



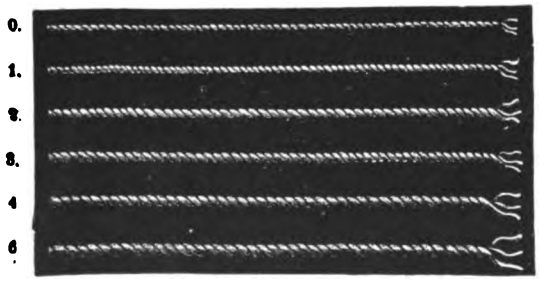
CARPENTERS' PENCILS.

FIGURE 862.



CHALK LINES.

FIGURE 863.

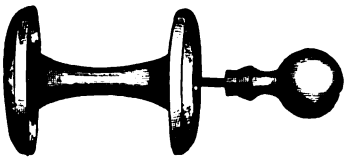


Full sizes.

CHALK LINE REEL.

WITH AWL.

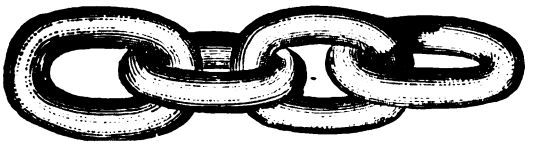
FIGURE 864.



HARDWARE.

CHAIN.

FIGURE 865.



CHISEL.

SOCKET FIRMER.

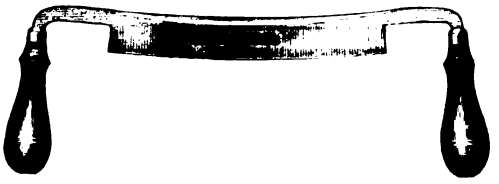
FIGURE 866.

PORTABLE FORGE.

FIGURE 868.

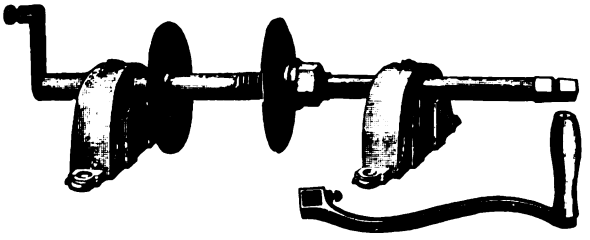
DRAWING KNIFE.

FIGURE 867.



GRINDSTONE FIXTURES.

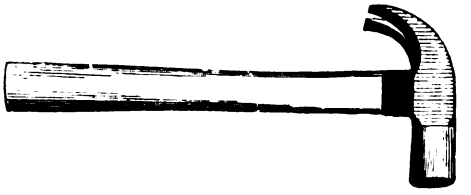
FIGURE 869.



NAIL HAMMER.

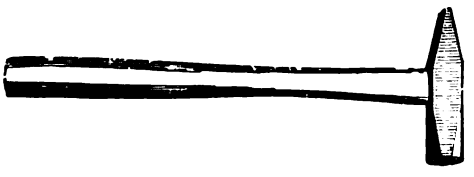
ADZE EYE.

FIGURE 870.



RIVETING HAMMER.

FIGURE 871.



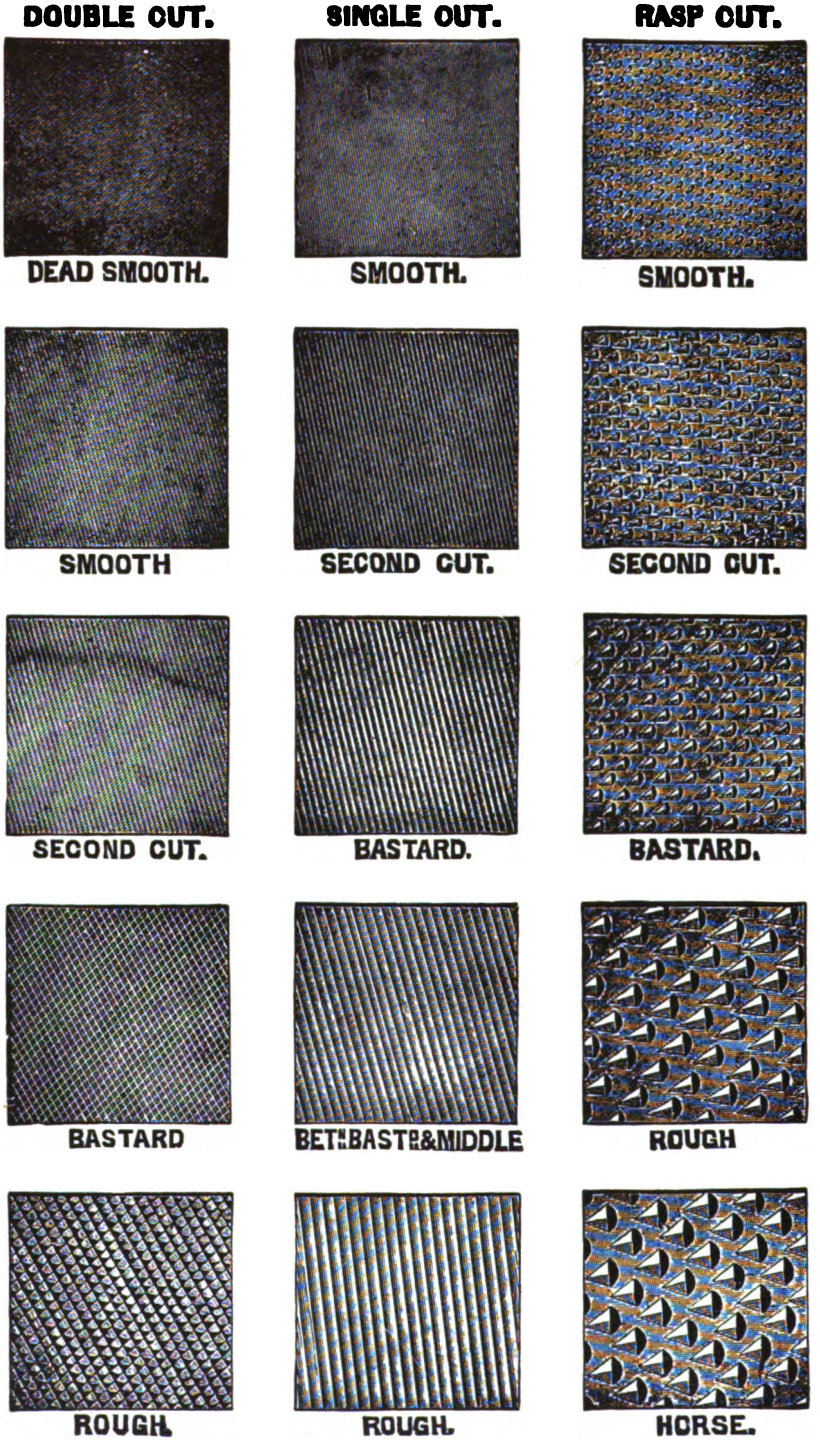
BALL PEEN HAMMER.

FIGURE 872.

HARDWARE.

FILES.

FIGURE 873.



Showing different kinds of file teeth.

HARDWARE.

SINGLE-BIT AXE HANDLE.

FIGURE 874.

DOUBLE-BIT AXE HANDLE.

FIGURE 875.

PICK HANDLE.

FIGURE 876.

SLEDGE HANDLE.

FIGURE 877.

ADZE HANDLE.

FIGURE 878.

ADZE-EYE HAMMER HANDLE.

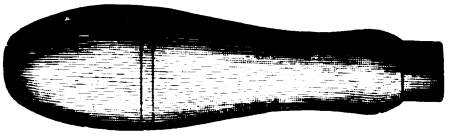
FIGURE 879.

HATCHET HANDLE.

FIGURE 880.

FILE HANDLE.

FIGURE 881.



AUGER HANDLES.

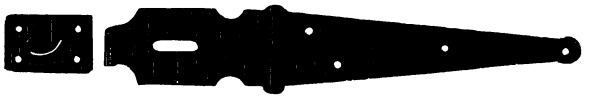
COMMON. FIGURE 882.

PATENT. FIGURE 883.

HARDWARE.

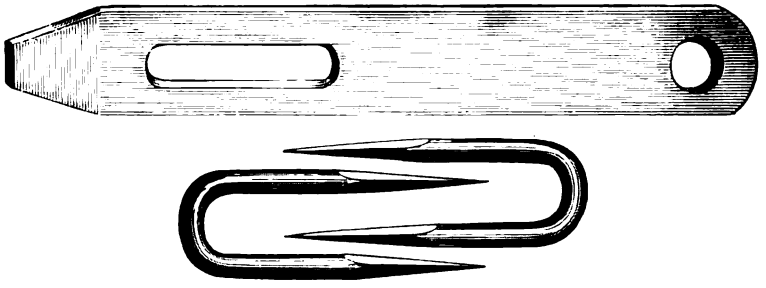
HINGE HASP.

FIGURE 884.



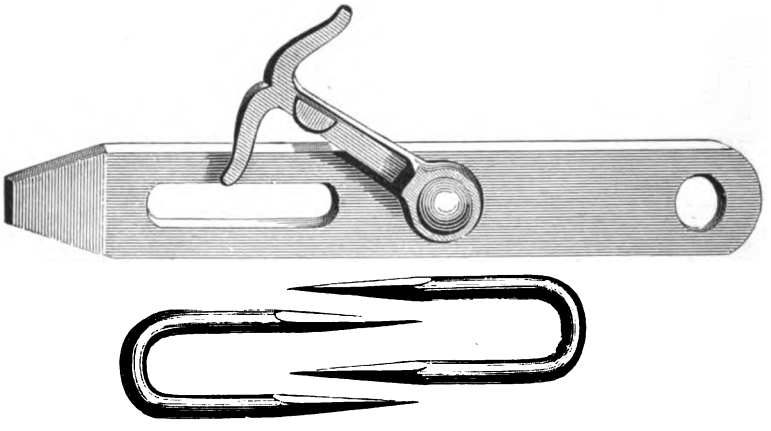
HASP AND STAPLES.

FIGURE 885.



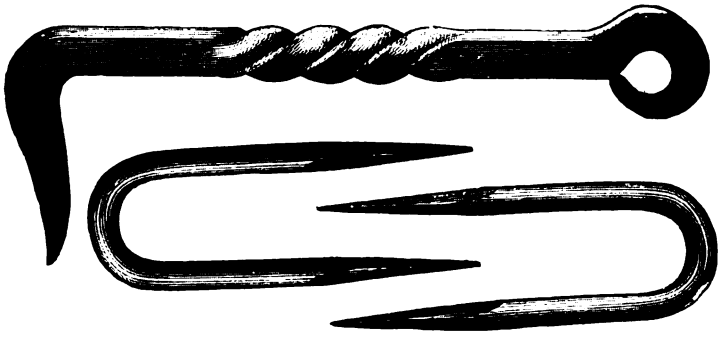
HASP AND STAPLES.—With Hook.

FIGURE 886.



HOOK AND STAPLES.

FIGURE 887.

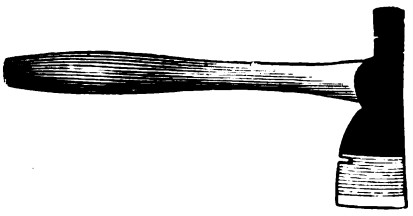


HARDWARE.

HATCHETS.

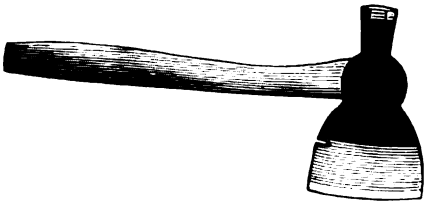
CLAW.

FIGURE 888.



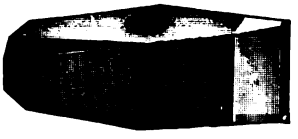
SHINGLING.

FIGURE 889.



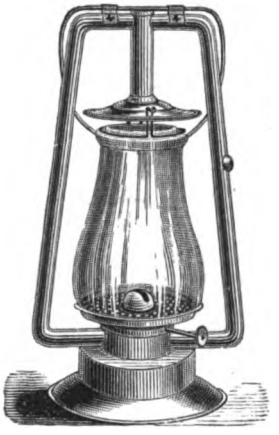
HOOP DRIVER.

FIGURE 890.



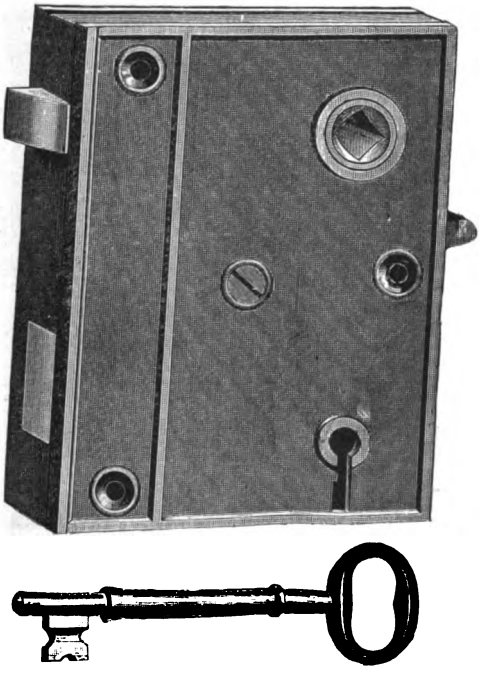
TUBULAR LANTERN.

FIGURE 891.



RIM DOOR LOCK.—UPRIGHT.

FIGURE 892.



KNOBS.

FIGURE 893.

Mineral or Porcelain.

FIGURE 894. No 00.
And Nos. 1 and 2.

Iron. 2½ In.

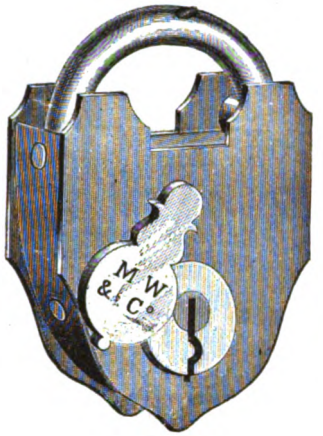
FIGURE 895. No. 1013.

Iron. 3 In.

FIGURE 896. No. 1029.

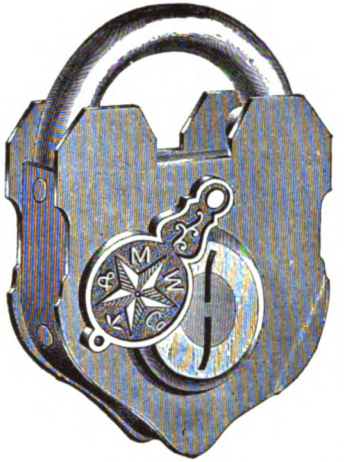
Iron. 2¼ In.

FIGURE 897. No. 1030.



Iron. 2½ In.

FIGURE 898. No. 1034.



Iron. 2½ In.

FIGURE 899. No. 1043.

Iron. 2¼ Inch.

FIGURE 900. No. 1052.

Iron. 2¼ In. Self-locking.

FIGURE 901. No. 1055.

Iron. 2½ In. Self-locking.

FIGURE 902.

Brass. 2½ In. Self-locking.

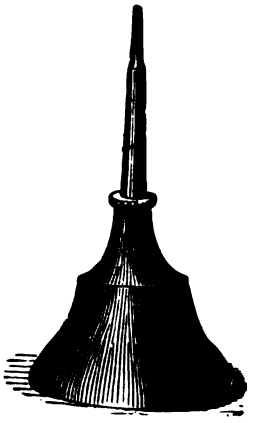
FIGURE 903. Nos. 261 & 262.

Scandinavian, or Jail Lock.

HARDWARE.

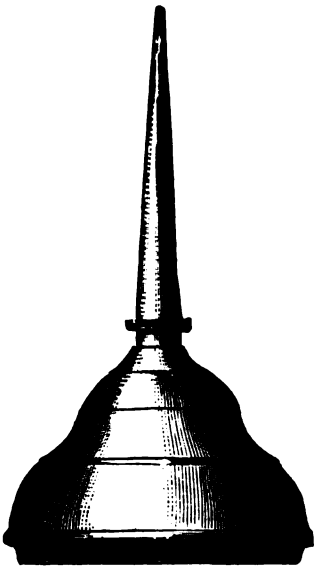
MALLEABLE IRON OILER.

FIGURE 904.



BROUGHTON'S PATENT OILER.

FIGURE 905.



Zinc or Brass.

COMMON OILER.

FIGURE 906.

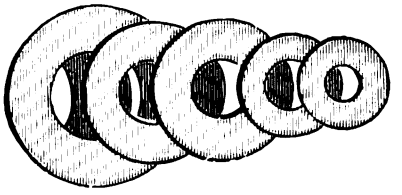
Zinc or Brass.

MACHINE BOLT.

FIGURE 907.

WASHERS.

FIGURE 908.



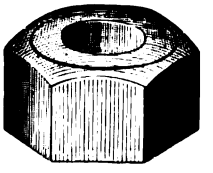
NUTS.

SQUARE.

FIGURE 909.

HEXAGON.

FIGURE 910.



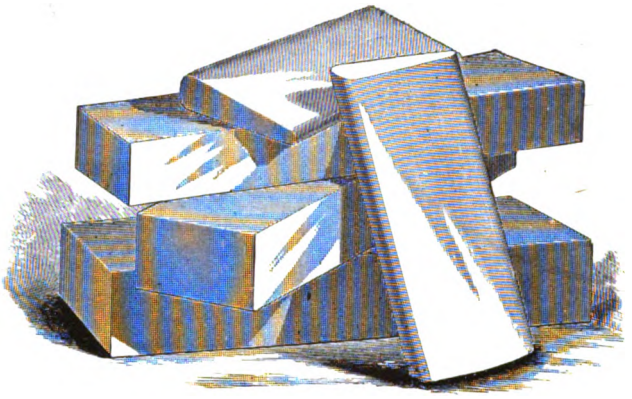
TWIST DRILL.

FIGURE 911.

HARDWARE.

OIL STONES.

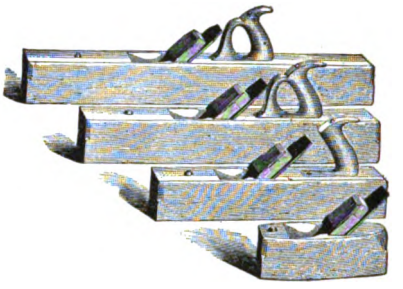
FIGURE 912.



Stones and Slips.

PLANES.

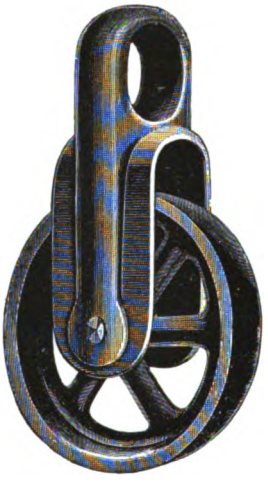
FIGURE 913.



Smooth, Jack, Fore and Jointer.

CLOTHES LINE PULLEY.

FIGURE 915.



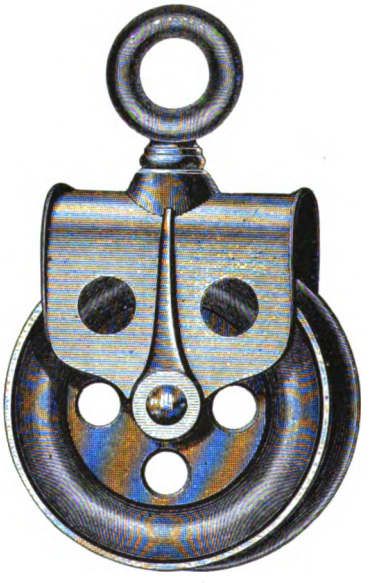
3 Inch.

PLUMB AND LEVEL.

FIGURE 914.

HAY FORK PULLEY.

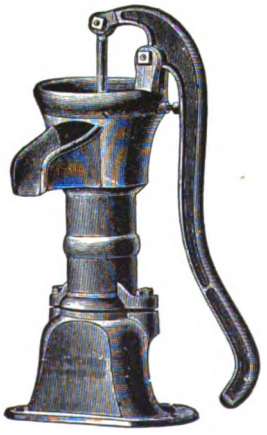
FIGURE 916.



5 Inch.

PITCHER SPOUT PUMP.

FIGURE 917.



RIVET SET.

FIGURE 918.

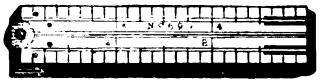
HARDWARE.

CALIPER RULE.—6 INCH.

FIGURE 919.

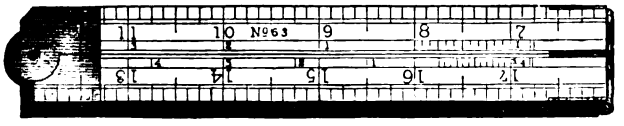
COMMON RULE.—12 INCH.

FIGURE 920.



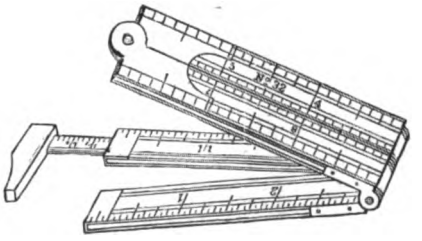
COMMON RULE.—24 INCH.

FIGURE 921.



CALIPER RULE.—12 INCH.

FIGURE 922.



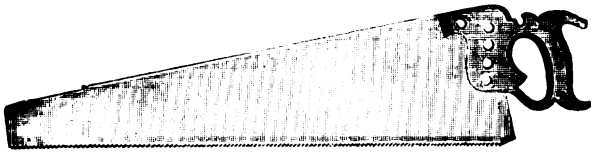
CROSS CUT SAW.

FIGURE 923.

Champion Pattern

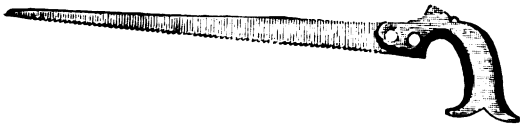
HAND SAW.—DISSTON'S.

FIGURE 924.



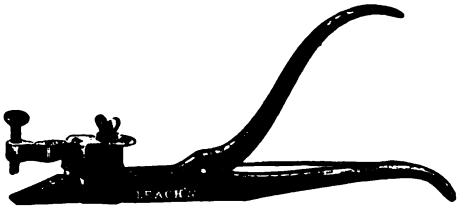
COMPASS SAW.

FIGURE 925.



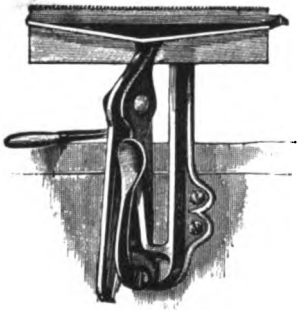
SAW SET.

FIGURE 927.



SAW VISE.—STEARN'S.

FIGURE 926.



SCRATCH AWL.

FIGURE 928.

HARDWARE.

COMMON SHOVEL.

FIGURE 929.

Iron or Steel.
Black or Polished.

PATENT SHOVEL.

FIGURE 930.

Remington's or
Chisholm's.

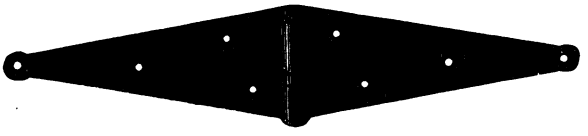
SCOOP.

FIGURE 931.

Black or Polished.

STRAP HINGE.

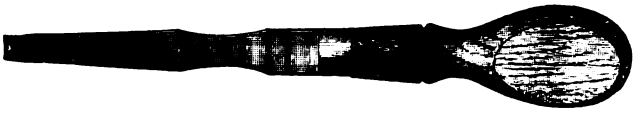
FIGURE 932.



Light or Heavy.

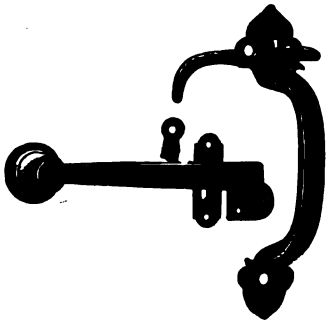
SCREW DRIVER.

FIGURE 934.



THUMB LATCH.

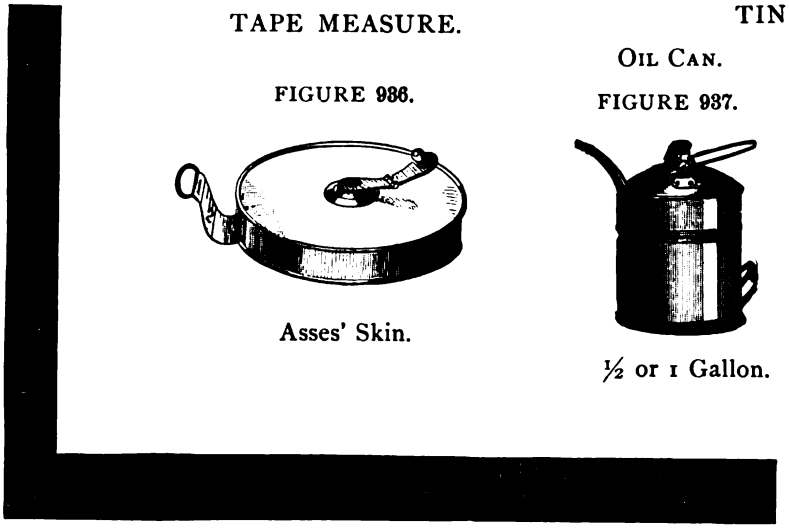
FIGURE 933.



HARDWARE.

SQUARE.

FIGURE 935.



Iron or Steel.

TAPE MEASURE.

FIGURE 936.

Asses' Skin.

TIN WARE.

OIL CAN.

FIGURE 937.

½ or 1 Gallon.

DINNER PAIL.

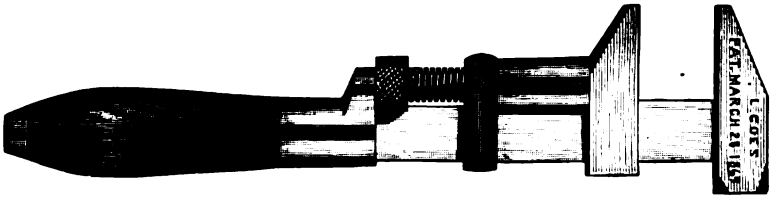
FIGURE 938.

5 or 6 Quarts.

WRENCHES.

COMMON MONKEY WRENCH.—COE'S PATENT.

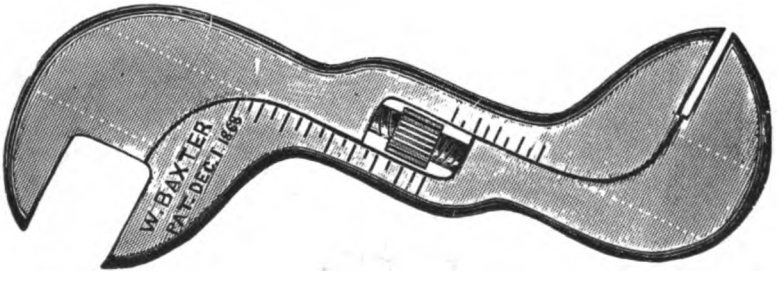
FIGURE 939.



Black or Polished.

BAXTER'S S WRENCH

FIGURE 940.



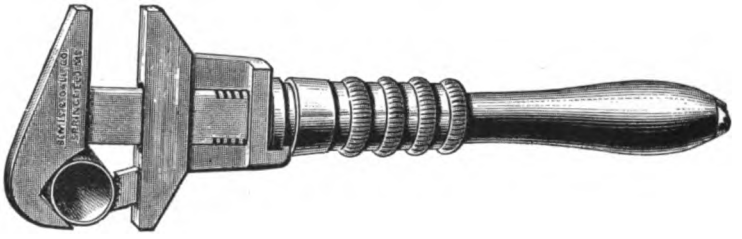
New Style.

HARDWARE.

WRENCHES.

BRIGGS' COMBINATION WRENCH.

FIGURE 941.



BRIGGS' WRENCH.

FIGURE 942.

STEEL WRENCHES.—Drop Forged.

No. 1.

FIGURE 943.

No. 2.

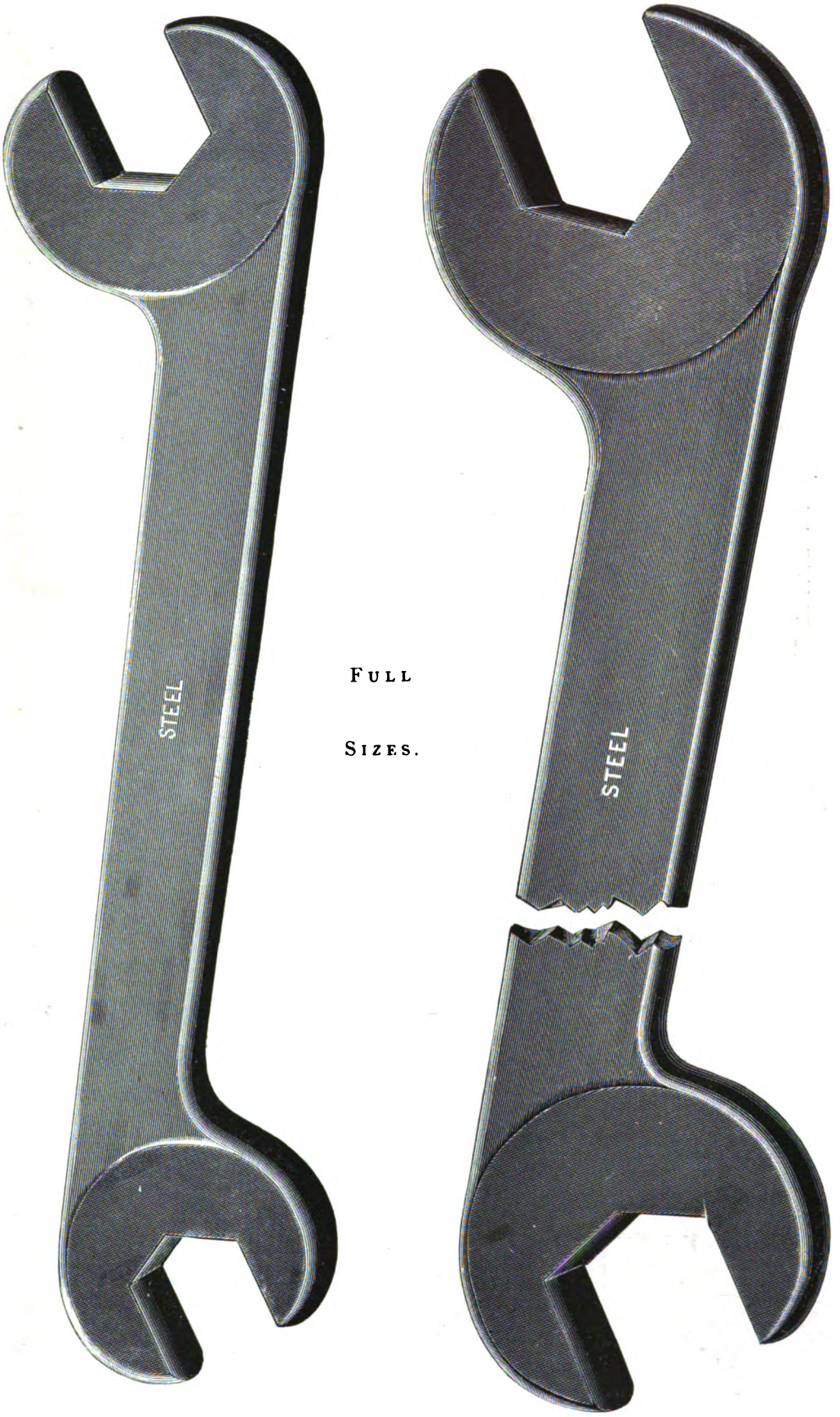
FIGURE 944.

Full Sizes.

STEEL WRENCHES.

No. 5. FIGURE 945.

No. 6. FIGURE 946.



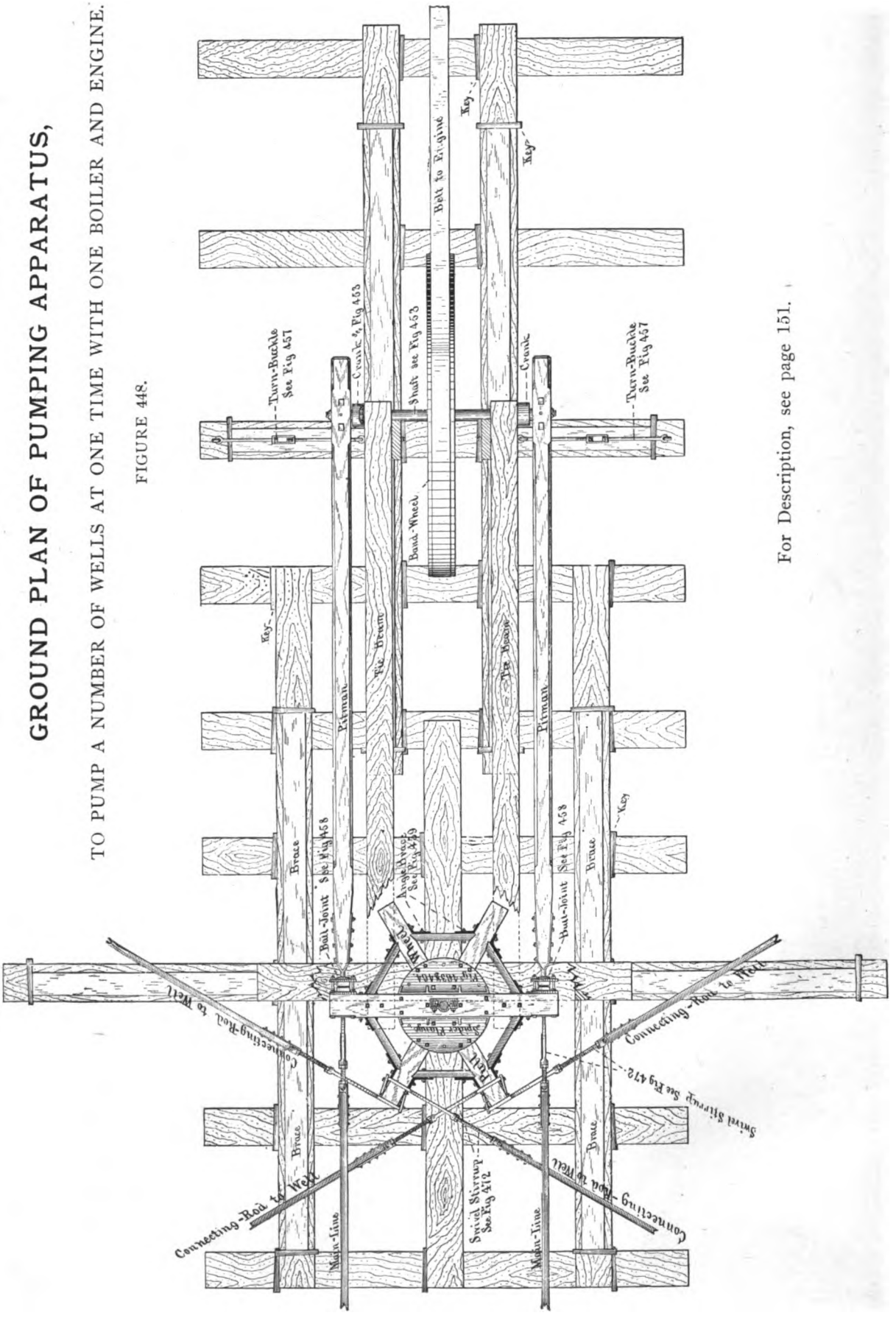
FULL SIZES.

Drop Forged.

GROUND PLAN OF PUMPING APPARATUS,

TO PUMP A NUMBER OF WELLS AT ONE TIME WITH ONE BOILER AND ENGINE.

FIGURE 448.

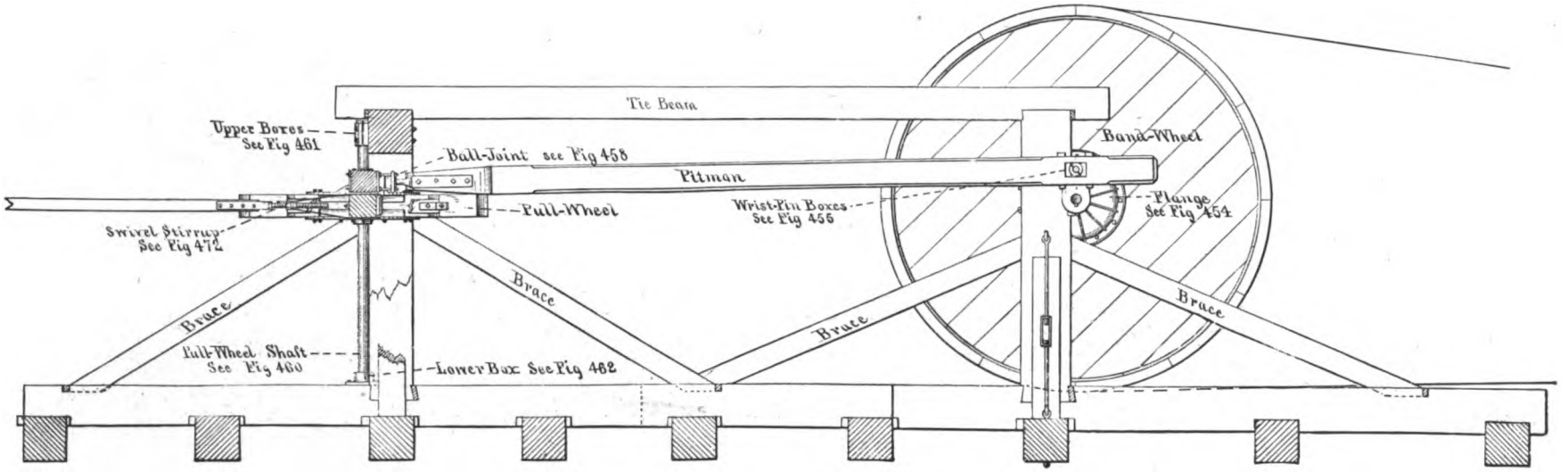


For Description, see page 151.

SIDE ELEVATION OF PUMPING APPARATUS,

TO PUMP A NUMBER OF WELLS AT ONE TIME WITH ONE BOILER AND ENGINE.

FIGURE 449.



As the whole power exerted is concentrated on the Band and Pull Wheels they should be so built, supported and braced as to have no vibration, nor liability to get out of line. The style of framing shown in this and the previous figure has been tried and found sufficient.

Detailed working plans can be specially furnished, when ordered, but the foregoing drawings are made to scale.

The Mud and Main Sills are 16 inches square. The Pitman is 6 x 8 inches and 28 feet long. The Band Wheel is 12 feet high.

WELL READY TO PUMP, CONNECTED TO MAIN LINE OF RODS.

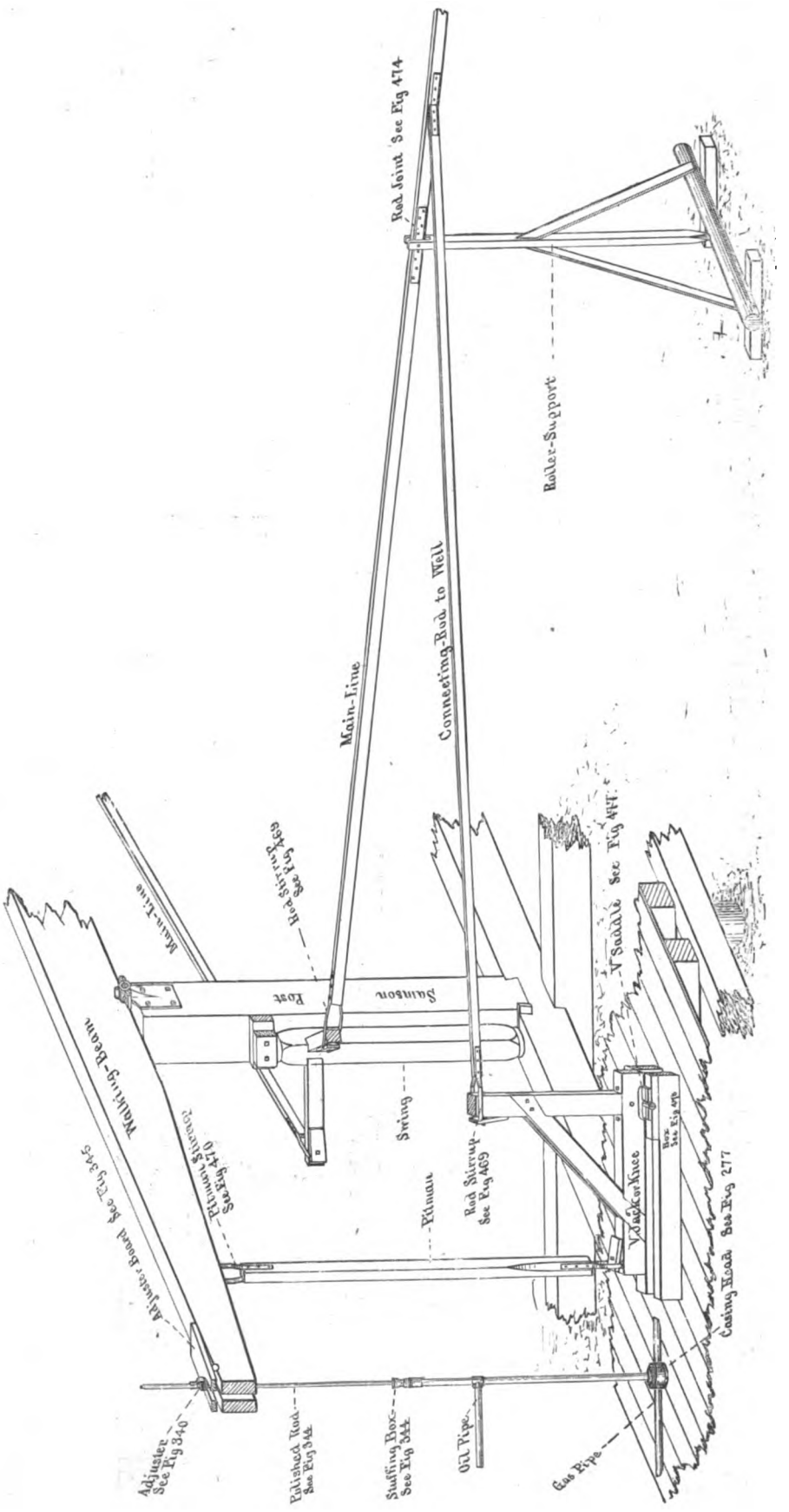
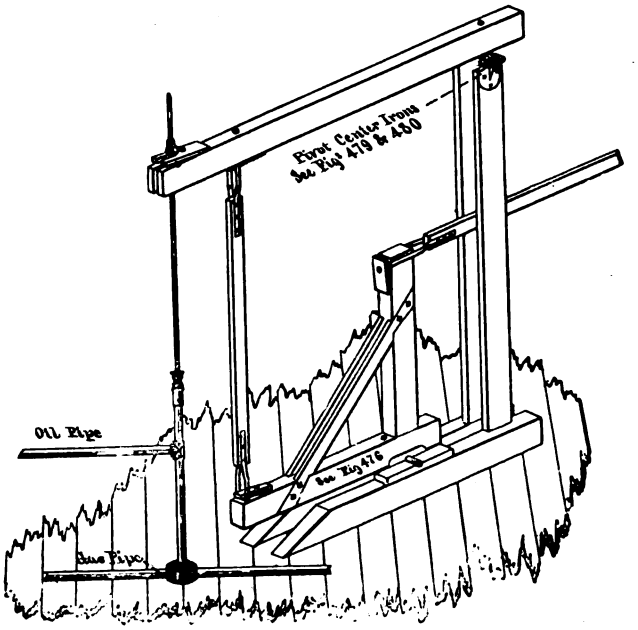


FIGURE 450.

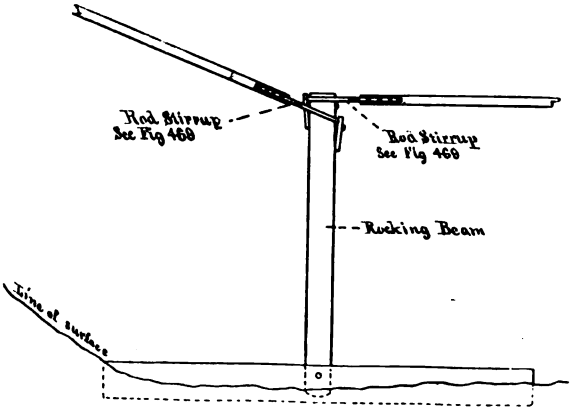
"GRASSHOPPER" APPARATUS FOR PUMPING.

FIGURE 451.



METHOD OF CHANGING INCLINATION OF RODS.

FIGURE 452.

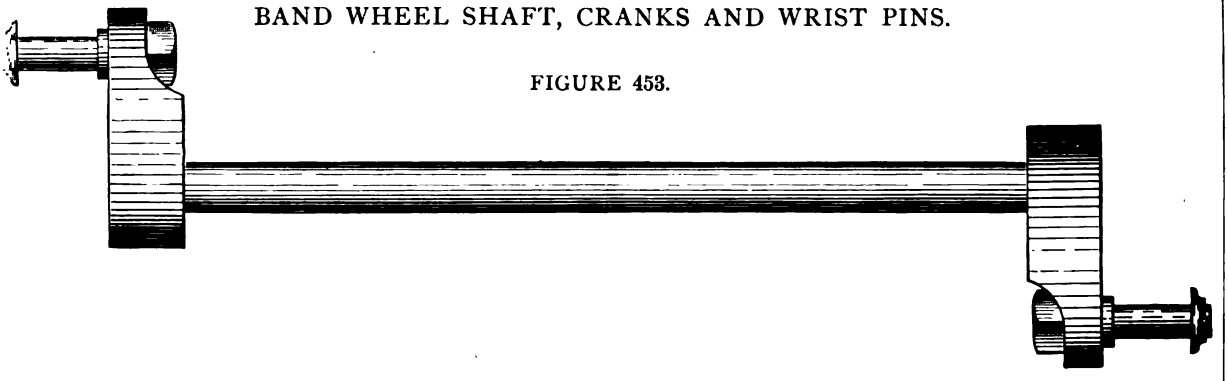


By this arrangement power can be carried up or down a hill.

PARTS OF THE APPARATUS USED TO PUMP A NUMBER OF WELLS TOGETHER.

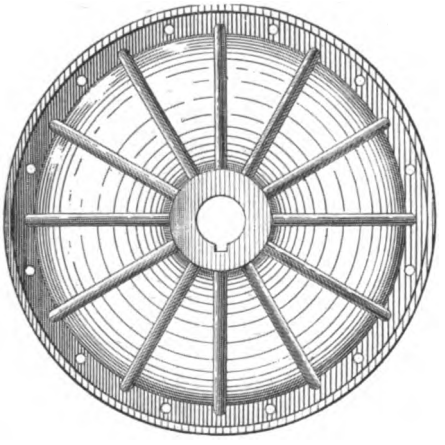
BAND WHEEL SHAFT, CRANKS AND WRIST PINS.

FIGURE 453.



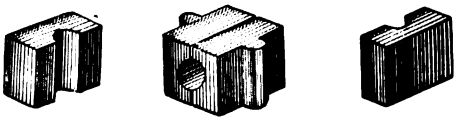
BAND WHEEL FLANGE.

FIGURE 454.



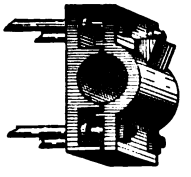
WRIST PIN BOXES.

FIGURE 455.



BOX FOR BAND WHEEL SHAFT.

FIGURE 456.

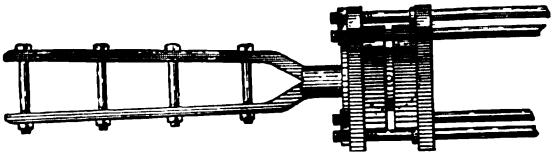


TURNBUCKLE.

FIGURE 457.

BALL JOINT FOR PULL WHEEL.

FIGURE 458.



ANGLE BRACE FOR PULL WHEEL ARMS.

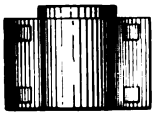
FIGURE 459.

PARTS OF PUMPING APPARATUS.

PULL WHEEL SHAFT.

FIGURE 460.

BOXES FOR PULL WHEEL SHAFT.

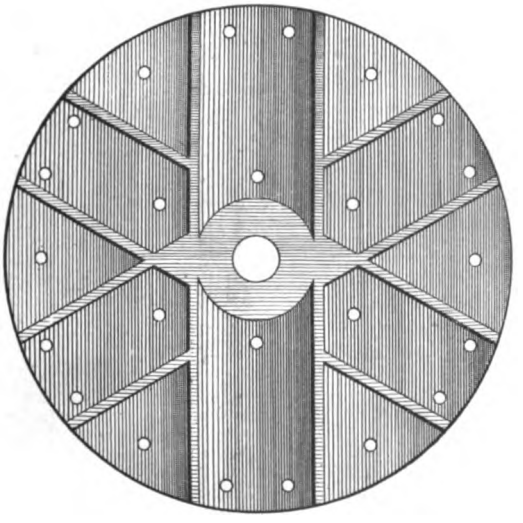
UPPER BOX.  FIGURE 461.

LOWER BOX.  FIGURE 462.

SPIDER FLANGES FOR PULL WHEEL SHAFT.

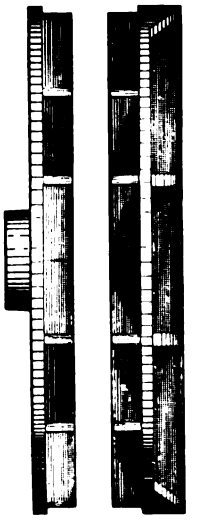
TOP VIEW.

FIGURE 463.



SIDE VIEW.

FIGURE 464.



STRAIN BOLT FOR PULL WHEEL.

BOLT.

FIGURE 465.

BOX.

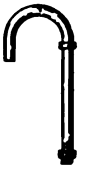
FIGURE 466.

ROCKER.

FIG. 467.

HOOK.

FIG. 468.

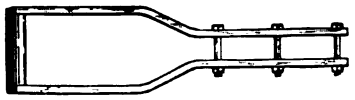


All comprised in a complete Strain Bolt.

PARTS OF PUMPING APPARATUS.

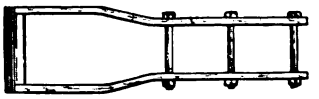
ROD STIRRUP.

FIGURE 469.



PITMAN STIRRUP.

FIGURE 470.



STIRRUP BOX.

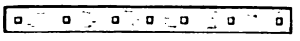
FIGURE 471.

SWIVEL STIRRUP FOR PULL WHEEL.

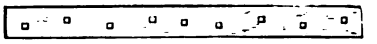
FIGURE 472.

CONNECTING ROD JOINTS (FISH PLATES).

$2 \times \frac{5}{16}$. FIGURE 473.



$2\frac{1}{2} \times \frac{1}{4}$. FIGURE 474.

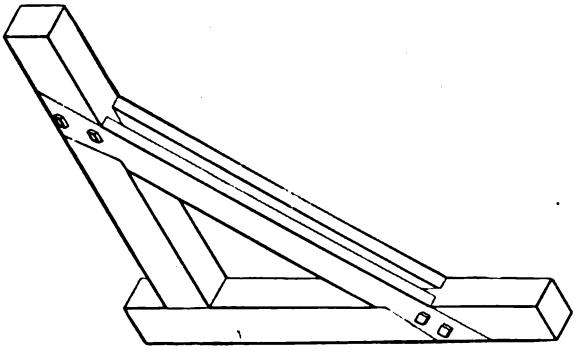


LINK CONNECTION.

FIGURE 475.

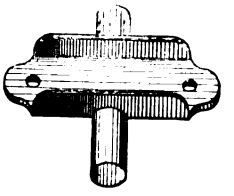
V JACK OR KNEE.

FIGURE 476.



V JACK OR KNEE SADDLE.

FIGURE 477.



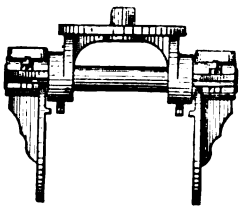
SADDLE BOX.

FIGURE 478.

PIVOT CENTRE IRONS FOR "GRASSHOPPER."

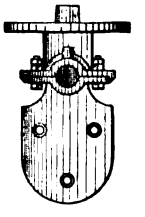
FRONT VIEW.

FIGURE 479.



SIDE VIEW.

FIGURE 480.



DESCRIPTION

OF THE FOREGOING APPARATUS AND PARTS.

FIGURES 448 TO 480.

This system of pumping wells has been in use for many years in the lower oil country and is being rapidly introduced into the upper. It is very economical, as ten wells can be operated with as little steam as three would require in any other system. The wells are so coupled as to balance. Sixteen wells can be directly connected to one pull wheel, and several times that number indirectly; and the main lines can be connected with and made to operate other pull wheels.

The expense of fitting up depends very much upon the surface and the distances apart of the wells. It may be estimated that ten wells on fifty acres can be coupled together for twelve hundred dollars, and a larger number proportionately less. When more than twenty wells are fitted up the average expense ought not to exceed one hundred dollars per well.

The power is transmitted from the engine to the band wheel (figure 449), which is from 12 to 14 feet in diameter, fastened to the flange (figure 454), and mounted on the shaft (figure 453), which shaft has two cranks and two wrist pins, to each of which a pitman is connected.

The cranks are set opposite to each other. The shaft is supported by two boxes, one of which is shown in figure 456.

The connection of the pitman to the wrist pin is made by the box shown in figure 455, which is in four parts; the two centre ones being pierced with a hole for the wrist pin, and provided with two vertical ribs, which rock in grooves in the end supports. This construction permits the vibration of the pitman, and the shaft (figure 453) can be shorter than the extreme spread of the pull wheel arms. The pitman is connected to the pull wheel by the ball joint (figure 458), which permits the pitman to adjust itself to any position.

The pull wheel has six arms, braced by the braces (figure 459), and fastened to the spider flanges (figures 463 and 464), and mounted on the shaft (figure 460). When in use this shaft is vertical, and the boxes (figures 461 and 462) are employed to support it. The connecting rods from one pull wheel to another, or from the pull wheel to the well, are fastened to the arms of the pull wheel, either by the strain bolt (figures 465 to 468), or by the swivel stirrup (figure 472). By these a rocking motion is allowed, and slackness can be taken up, or tension loosened.

The rods are united together by joints, or fish plates (figure 473 or 474), as shown in figures 415 and 416, on page 82.

The rods are carried from the pull wheel in nearly horizontal directions, and the change from horizontal to vertical motion is made by the V jack or knee (figure 476).

The rod stirrup (figure 469) connects the rods to the V jack. This is pivoted on the saddle (figure 477), which rocks in the saddle box figure 478).

A pitman connects the lower arm, either to the walking beam as in figure 450, or to the "grasshopper" (figure 451). The latter arrangement is preferred, because the rods drop better, and the centre irons (figures 479 and 480) swing on a pivot, so the beam can be turned out of the way when necessary. Each end of the pitman is provided with a stirrup (figure 470) working in the box (figure 471).

The turnbuckle (figure 457) holds the band wheel post firmly in position.

The link connection (figure 475) is introdued on the rods between two pull wheels, so that in case of any accident, the rods beyond the link will not be injured.

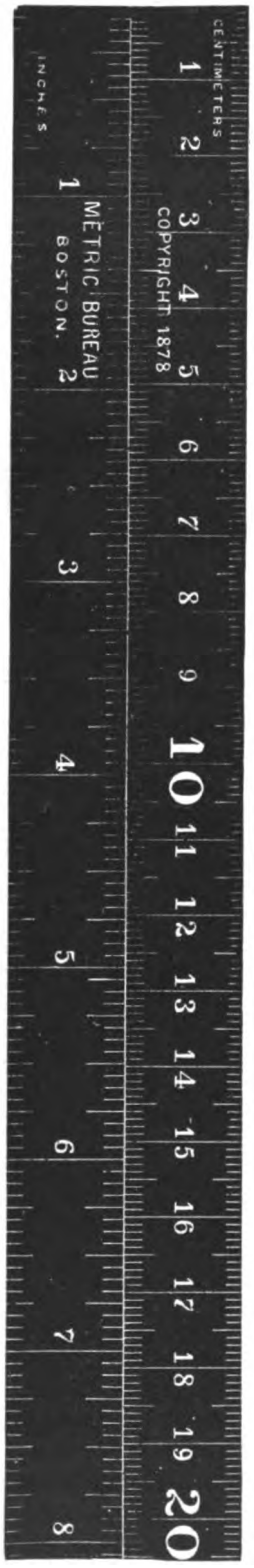
In figure 452 is shown the way in which the inclination of the rods is changed, when it is necessary to carry them up a hill, and the same way can be employed when necessary to transmit the motion downward.

A similar rocking beam can be employed to lengthen or shorten the pumping stroke at any well, by making the stirrup connections at proper distances from the fulcrum.

The rods are supported at every joint either by a gallows frame and swinging rod, or by the rocker support shown in figure 450.

These supports are made of rough timber, and are constructed on the ground, as their lengths vary according to the surface, as the rods are carried as nearly as possible in straight lines.

We furnish each and every part illustrated and described, except the rocker supports.



TABLE

Of the principal Lengths and Weights mentioned in this Catalogue, and their approximate equivalents in terms of the Metric System.

LENGTH.

1	Metre	equals	39.370432	Inches.
1	"	"	3.3	Feet.
1	Inch	"	0.0254	Metre.
1	Foot (twelve inches)	"	0.3048	"
2	Inches (page 6)	"	0.05	"
4	" "	"	0.1	"
8	" "	"	0.2	"
12	" " (one foot)	"	0.3048	"
16	" "	"	0.4	"
20	" "	"	0.5	"
4	Feet "	"	1.22	"
8	" "	"	2.438	"
12	" "	"	3.658	"
16	" "	"	4.877	"
20	" "	"	6.096	"
24	" "	"	7.315	"
30	" "	"	9.144	"
72	" (page 10)	"	21.9456	"

The derrick (figure 1) is 20 feet (6 metres) square at the base, and 72 feet (22 metres) high.

WEIGHT.

1	Pound equals 453.592 Grammes =	0.4536	Kilogramme.
1	Gramme equals	0.03527	Ounce.
100	Pounds "	45.36	Kilogrammes.
1	Kilogramme "	2.2046	Pounds.
25	Pounds (page 7) "	11.34	Kilogrammes.
100	" " "	45.36	"
400	" (page 12) "	181.43	"
300	" " "	136.	"
1050	" " "	476.28	"
140	" " "	63.50	"
75	" " "	34.02	"

The weight of a full set of tools is about 2,500 pounds or 1,134 kilogrammes.

The diameter of an oil well is 5½ inches (14 centimetres).

A shallow well is less than 600 feet (183 metres) deep.

A deep well is over 1,000 feet (305 metres) deep.

43 x 21 feet on page 25 equals 13 x 6 metres.

58 feet (height of derrick on page 27) equals 17.7 metres.

35 feet (height of derrick on page 32) equals 10.7 metres.

Weight of portable rig, page 36, about two tons = 4,000 pounds = 1814 Kilogrammes.

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